Jeff Parker

Operations Manager

Marathon Oil Company

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November 1, 2018

Via Certified Mail: 7015 0640 0006 6407 1036

U. S. Environmental Protection Agency
Director, Air and Toxics Technical Enforcement Program
Office of Enforcement, Compliance, and Environmental Justice
Mail Code 8ENF-AT
1595 Wynkoop Street
Denver, Colorado 80202-1129



RECEIVED

NOV 6 - 2018

Office of Enforcement, Compliance and Environmental Justice

Dear Administrator:

In accordance with the requirements of Title 40 Code of Federal Regulations (CFR) Subpart OOOOa, Standards of Performance for Crude Oil and Natural Gas Facilities for which construction, modification, or reconstruction commenced after September 18, 2015, Marathon Oil Company (Marathon) hereby submits its annual report for the August 2, 2017 through August 1, 2018 reporting period as required by 40 CFR 49.4168(b). The report information is listed by regulatory citation as noted below:

40 CFR 5420a(b)(1)(i) The company name, facility site name associated with the affected facility, US Well ID or US Well ID associated with the affected facility, if applicable, and address of the affected facility. If an address is not available for the site, include a description of the site location and provide the latitude and longitude coordinates of the site in decimal degrees to an accuracy and precision of five (5) decimals of a degree using the North American Datum of 1983.

The company name is Marathon Oil Company, and the facility site name, well API number, and coordinates of each site are included in **Appendix A**.

40 CFR 5420a(b)(1)(ii) An identification of each affected facility being included in the annual report.

Appendix B contains a list of affected facilities by facility site name.

40 CFR 5420a(b)(1)(iii) Beginning and ending dates of the reporting period.

The reporting period is August 2, 2017 through August 1, 2018.

40 CFR 5420a(b)(1)(iv) A certification by a certifying official of truth, accuracy, and completeness. This certification shall state that, based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.

I certify based on information and belief formed after reasonable inquiry, that the statements and information in this document are true, accurate, and complete.

40 CFR 5420a(b)(2)(i) For each well affected facility, records of each well completion operation as specified in paragraphs (c)(1)(i) through (iv) and (vi) of §60.5420a, if applicable, for each well affected facility conducted during the reporting period. In lieu of submitting the records specified in paragraph (c)(1)(i) through (iv) of §60.5420a, the owner or operator may submit a list of the well completions with hydraulic fracturing completed during the reporting period and the records required by paragraph (c)(1)(v) of §60.5420a for each well completion.

- 1) Records identifying each well completion operation for each well affected facility;
 - Records of deviations in cases where well completion operations with hydraulic fracturing were not performed in compliance with the requirements specified in §60.5375a.
 - b) Records required in §60.5375a(b) or (f)(3) for each well completion operation conducted for each well affected facility that occurred during the reporting period. You must maintain the records specified in paragraphs (c)(1)(iii)(A) through (C) of this section.
 - i) (A) For each well affected facility required to comply with the requirements of §60.5375a(a), you must record: The location of the well; the United States Well Number; the date and time of the onset of flowback following hydraulic fracturing or re-fracturing; the date and time of each attempt to direct flowback to a separator as required in §60.5375a(a)(1)(ii); the date and time of each occurrence of returning to the initial flowback stage under §60.5375a(a)(1)(i); and the date and time that the well was shut in and the flowback equipment was permanently disconnected, or the startup of production; the duration of flowback; duration of recovery and disposition of recovery (i.e., routed to the gas flow line or collection system, re-injected into the well or another well, used as an onsite fuel source, or used for another useful purpose that a purchased fuel or raw material would serve); duration of combustion; duration of venting; and specific reasons for venting in lieu of capture or combustion. The duration must be specified in hours. In addition, for wells where it is technically infeasible to route the recovered gas to any of the four options specified in §60.5375a(a)(1)(ii), you must record the reasons for the claim of technical infeasibility with respect to all four options provided in that subparagraph, including but not limited to; name and location of the nearest gathering line and technical considerations preventing routing to this line; capture, reinjection, and reuse technologies considered and aspects of gas or equipment preventing use of recovered gas as a fuel onsite; and technical considerations preventing use of recovered gas for other useful purpose that that a purchased fuel or raw material would serve.

- c) For each well affected facility required to comply with the requirements of §60.5375a(f), you must maintain the records specified in paragraph (c)(1)(iii)(A) of §60.5420a except that you do not have to record the duration of recovery to the flow line.
- d) For each well affected facility for which you make a claim that it meets the criteria of §60.5375a(a)(1)(iii)(A), you must maintain the following:
 - i) Records specified in paragraph (c)(1)(iii)(A) of this section except that you do not have to record: The date and time of each attempt to direct flowback to a separator; the date and time of each occurrence of returning to the initial flowback stage; duration of recovery and disposition of recovery (i.e. routed to the gas flow line or collection system, re-injected into the well or another well, used as an onsite fuel source, or used for another useful purpose that a purchased fuel or raw material would serve.
 - ii) If applicable, records that the conditions of §60.5375a(1)(iii)(A) are no longer met and that the well completion operation has been stopped and a separator installed. The records shall include the date and time the well completion operation was stopped and the date and time the separator was installed.
 - iii) A record of the claim signed by the certifying official that no liquids collection is at the well site. The claim must include a certification by a certifying official of truth, accuracy and completeness. This certification shall state that, based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.
 - iv) For each well affected facility for which you claim an exception under §60.5375a(a)(3), you must record: The location of the well; the United States Well Number; the specific exception claimed; the starting date and ending date for the period the well operated under the exception; and an explanation of why the well meets the claimed exception.

Well completions with hydraulic fracturing which occurred during the reporting period are included in **Appendix C**. Marathon does not claim any exceptions under §60.5375a(a)(3).

40 CFR 5420a(b)(2)(ii) For each well affected facility, records of deviations specified in paragraph (c)(1)(ii) of §60.5420a that occurred during the reporting period.

There were no deviations associated with well completion operations which occurred during the reporting period.

40 CFR 5420a(b)(2)(iii) For each well affected facility, records specified in paragraph (c)(1)(vii) of §60.5420a, if applicable, that support a determination under 60.5432a that the well affected facility is a low pressure well as defined in 60.5430a.

There were no low pressure well completion operations which occurred during the reporting period.

<u>40 CFR 5420a(b)(3)(i)</u> For each centrifugal compressor affected facility, an identification of each centrifugal compressor using a wet seal system constructed, modified or reconstructed during the reporting period.

There were no centrifugal compressor affected facilities using a wet seal system constructed, modified, or reconstructed by Marathon during the reporting period.

40 CFR 5420a(b)(3)(ii) For each centrifugal compressor affected facility, records of deviations specified in paragraph (c)(2) of §60.5420a that occurred during the reporting period.

There were no deviations associated with centrifugal compressor affected facilities during the reporting period.

40 CFR 5420a(b)(3)(iii) For each centrifugal compressor affected facility, if required to comply with §60.5380a(a)(2), the records specified in paragraphs (c)(6) through (11) of §60.5420a.

Marathon did not operate, construct, modify, or reconstruct any centrifugal compressor affected facility during the reporting period. Therefore there are no records as specified in paragraphs (c) (6) through (11) of §60.5420a.

40 CFR 5420a(b)(3)(iv) If complying with §60.5380a(a)(1) with a control device tested under §60.5413a(d) which meets the criteria in §60.5413a(d)(11) and §60.5413a(e), records specified in paragraph (c)(2)(i) through (c)(2)(vii) of §60.5420a for each centrifugal compressor using a wet seal system constructed, modified or reconstructed during the reporting period.

Marathon did not operate any centrifugal compressors with wet seal systems during the reporting period.

<u>40 CFR 5420a(b)(4)(i)</u> For each reciprocating compressor affected facility, the cumulative number of hours of operation or the number of months since initial startup or since the previous reciprocating compressor rod packing replacement, whichever is later. Alternatively, a statement that emissions from the rod packing are being routed to a process through a closed vent system under negative pressure.

Marathon did not operate construct, modify, or reconstruct any reciprocating compressor affected facilities during the reporting period.

40 CFR 5420a(b)(4)(ii) For each reciprocating compressor affected facility, records of deviations specified in paragraph (c)(3)(iii) of §60.5420a that occurred during the reporting period.

Marathon did not construct, modify, or reconstruct any reciprocating compressor affected facilities during the reporting period.

40 CFR 5420a(b)(5)(i) For each pneumatic controller affected facility, an identification of each pneumatic controller constructed, modified or reconstructed during the reporting period, including the identification information specified in §60.5390a(b)(2) or (c)(2).

Marathon did not construct, modify, or reconstruct any pneumatic controller affected facilities during the reporting period

40 CFR 5420a(b)(5)(ii) For each pneumatic controller affected facility, if applicable, documentation that the use of pneumatic controller affected facilities with a natural gas bleed rate greater than 6 standard cubic feet per hour are required and the reasons why.

Marathon did not construct, modify, or reconstruct any pneumatic controller affected facilities during the reporting period.

40 CFR 5420a(b)(5)(iii) For each pneumatic controller affected facility, records of deviations specified in paragraph (c)(4)(v) of §60.5420a that occurred during the reporting period.

Marathon did not construct, modify, or reconstruct any pneumatic controller affected facilities during the reporting period.

<u>40 CFR 5420a(b)(6)(i)</u> For each storage vessel affected facility, an identification, including the location, of each storage vessel affected facility for which construction, modification or reconstruction commenced during the reporting period. The location of the storage vessel shall be in latitude and longitude coordinates in decimal degrees to an accuracy and precision of five (5) decimals of a degree using the North American Datum of 1983.

Appendix D contains a list of storage vessel affected facilities.

40 CFR 5420a(b)(6)(ii) For each storage vessel affected facility, documentation of the VOC emission rate determination according to §60.5365a(e) for each storage vessel that became an affected facility during the reporting period or is returned to service during the reporting period.

Storage vessel affected facility VOC emission rate determinations are included in Appendix E.

40 CFR 5420a(b)(6)(iii) For each storage vessel affected facility, records of deviations specified in paragraph (c)(5)(iii) of §60.5420a that occurred during the reporting period.

Deviations associated with storage tank requirements are identified in **Appendix F** by facility site name.

40 CFR 5420a(b)(6)(iv) For each storage vessel affected facility, a statement that you have met the requirements specified in §60.5410a(h)(2) and (3).

VOC emission rates were reduced in accordance with the requirements of §60.5365a(e)(1) through (e)(4) including the cover requirements specified in §60.5411a(b) and the closed vent system requirements specified in §60.5411a(c). A control device was used to reduce emissions, and initial compliance was determined by meeting the requirements in §60.5395a(e), including the control device requirements in §60.5412a(d)(3). The control device requirements in §60.5412a(c) did not apply since Marathon does not operate any carbon absorption systems.

40 CFR 5420a(b)(6)(v) For each storage vessel affected facility, you must identify each storage vessel affected facility that is removed from service during the reporting period as specified in §60.5395a(c)(1)(ii), including the date the storage vessel affected facility was removed from service.

No storage vessel affected facilities were removed from service during the reporting period.

40 CFR 5420a(b)(6)(vi) You must identify each storage vessel affected facility returned to service during the reporting period as specified in §60.5395a(c)(3), including the date the storage vessel affected facility was returned to service.

No storage vessel affected facility was returned to service during the reporting period.

40 CFR 5420a(b)(6)(vii) For each storage vessel affected facility, if complying with §60.5395a(a)(2) with a control device tested under §60.5413a(d) which meets the criteria in §60.5413a(d)(11) and §60.5413a(e), records specified in paragraphs (c)(5)(vi)(A) through (F) of §60.5420a for each storage vessel constructed, modified, reconstructed or returned to service during the reporting period.

Marathon did not operate any combustion control devices with a manufacturer's performance test during the reporting period.

40 CFR 5420a(b)(7) For the collection of fugitive emissions components at each well site and the collection of fugitive emissions components at each compressor station within the company-defined area, the records of each monitoring survey including the information specified in paragraphs (b)(7)(i) through (xii) of §60.5420a . For the collection of fugitive emissions components at a compressor station, if a monitoring survey is waived under §60.5397a(g)(5), you must include in your annual report the fact that a monitoring survey was waived and the calendar months that make up the quarterly monitoring period for which the monitoring survey was waived.

- 1) Date of the survey.
- 2) Beginning and end time of the survey.
- Name of operator(s) performing survey. If the survey is performed by optical gas imaging, you must note the training and experience of the operator.
- 4) Ambient temperature, sky conditions, and maximum wind speed at the time of the survey.
- 5) Monitoring instrument used.

- 6) Any deviations from the monitoring plan or a statement that there were no deviations from the monitoring plan.
- 7) Number and type of components for which fugitive emissions were detected.
- 8) Number and type of fugitive emissions components that were not repaired as required in §60.5397a(h).
- 9) Number and type of difficult-to-monitor and unsafe-to-monitor fugitive emission components monitored.
- 10) The date of successful repair of the fugitive emissions component.
- 11) Number and type of fugitive emission components placed on delay of repair and explanation for each delay of repair.
- 12) Type of instrument used to resurvey a repaired fugitive emissions component that could not be repaired during the initial fugitive emissions finding.

The required records are located in Appendix G.

40 CFR 5420a(b)(8)(i) For each pneumatic pump that is constructed, modified or reconstructed during the reporting period, you must provide certification that the pneumatic pump meets one of the conditions described in paragraphs (b)(8)(i)(A), (B) or (C) of this section.

- 1) No control device or process is available on site.
- 2) A control device or process is available on site and the owner or operator has determined in accordance with §60.5393a(b)(5) that it is technically infeasible to capture and route the emissions to the control device or process.
- 3) Emissions from the pneumatic pump are routed to a control device or process. If the control device is designed to achieve less than 95 percent emissions reduction, specify the percent emissions reductions the control device is designed to achieve.

No pneumatic pumps were constructed, modified, or reconstructed at the facilities listed in **Appendix A** during the reporting period.

40 CFR 5420a(b)(8)(ii) For any pneumatic pump affected facility which has been previously reported as required under paragraph (b)(8)(i) of §60.5420a and for which a change in the reported condition has occurred during the reporting period, provide the identification of the pneumatic pump affected facility and the date it was previously reported and a certification that the pneumatic pump meets one of the conditions described in paragraphs (b)(8)(ii)(A), (B) or (C) or (D) of this section.

- 1) A control device has been added to the location and the pneumatic pump now reports according to paragraph (b)(8)(i)(C) of this section.
- 2) A control device has been added to the location and the pneumatic pump affected facility now reports according to paragraph (b)(8)(i)(B) of this section.
- 3) A control device or process has been removed from the location or otherwise is no longer available and the pneumatic pump affected facility now report according to paragraph (b)(8)(i)(A) of this section.
- 4) A control device or process has been removed from the location or is otherwise no longer available and the owner or operator has determined in accordance with §60.5393a(b)(5)

through an engineering evaluation that it is technically infeasible to capture and route the emissions to another control device or process.

No pneumatic pumps were constructed, modified, or reconstructed at the facilities listed in **Appendix A** during the reporting period.

40 CFR 5420a(b)(8)(iii) For any pneumatic pump affected facility, records of deviations specified in paragraph (c)(16)(ii) of §5420a that occurred during the reporting period.

No pneumatic pumps were constructed during the reporting period.

40 CFR 5420a(b)(9) Within 60 days after the date of completing each performance test (see §60.8) required by 40 CFR 60.5420a, except testing conducted by the manufacturer as specified in §60.5413a(d), you must submit the results of the performance test following the procedure specified in either paragraph (b)(9)(i) or (ii) of §60.5420a.

- 1) For data collected using test methods supported by the EPA's Electronic Reporting Tool (ERT) as listed on the EPA's ERT Web site (https://www3.epa.gov/ttn/chief/ert/ert_info.html) at the time of the test, you must submit the results of the performance test to the EPA via the Compliance and Emissions Data Reporting Interface (CEDRI). (CEDRI can be accessed through the EPA's Central Data Exchange (CDX) (https://cdx.epa.gov/).) Performance test data must be submitted in a file format generated through the use of the EPA's ERT or an alternate electronic file format consistent with the extensible markup language (XML) schema listed on the EPA's ERT Web site. If you claim that some of the performance test information being submitted is confidential business information (CBI), you must submit a complete file generated through the use of the EPA's ERT or an alternate electronic file consistent with the XML schema listed on the EPA's ERT Web site, including information claimed to be CBI, on a compact disc, flash drive, or other commonly used electronic storage media to the EPA. The electronic media must be clearly marked as CBI and mailed to U.S. EPA/OAQPS/CORE CBI Office, Attention: Group Leader, Measurement Policy Group, MD C404-02, 4930 Old Page Rd., Durham, NC 27703. The same ERT or alternate file with the CBI omitted must be submitted to the EPA via the EPA's CDX as described earlier in this paragraph.
- 2) For data collected using test methods that are not supported by the EPA's ERT as listed on the EPA's ERT Web site at the time of the test, you must submit the results of the performance test to the Administrator at the appropriate address listed in §60.4.

No performance tests were conducted by Marathon during the reporting period.

40 CFR 5420a(b)(10) For combustion control devices tested by the manufacturer in accordance with §60.5413a(d), an electronic copy of the performance test results required by §60.5413a(d) shall be submitted via email to Oil_and_Gas_PT@EPA.GOV unless the test results for that model of combustion control device are posted at the following Web site: epa.gov/airquality/oilandgas/.

No combustion control devices were installed by Marathon during the reporting period.

40 CFR 5420a(b)(11) You must submit reports to the EPA via the CEDRI. (CEDRI can be accessed through the EPA's CDX (https://cdx.epa.gov/).) You must use the appropriate electronic report in CEDRI for this subpart or an alternate electronic file format consistent with the extensible markup language (XML) schema listed on the CEDRI Web site (https://www3.epa.gov/ttn/chief/cedri/). If the reporting form specific to this subpart is not available in CEDRI at the time that the report is due, you must submit the report to the Administrator at the appropriate address listed in §60.4. Once the form has been available in CEDRI for at least 90 calendar days, you must begin submitting all subsequent reports via CEDRI. The reports must be submitted by the deadlines specified in this subpart, regardless of the method in which the reports are submitted.

No reports were submitted to the EPA via the CEDRI by Marathon during the reporting period.

40 CFR 5420a(b)(12) You must submit the certification signed by the qualified professional engineer according to §60.5411a(d) for each closed vent system routing to a control device or process.

The certifications signed by a qualified professional engineer according to §60.5411a(d) were included in Appendix H for the wells included in Appendix A which were designed and constructed during the reporting period.

Please do not hesitate to contact me if you require additional information concerning this report.

Sincerely,

(b) (6)

Jeff Parker

Appendix A -- List of Affected Facilities Sites

Well/Facility Name	API Number	Latitude	Longitude
Bingo 24-10TFH	33-061-03580	(b) (9)	(b) (9)
Marjorie 14-10H	33-061-03579		
JL Shobe 24-10TFH	33-061-03581		
Charlie 24-10H	33-061-03582		
Mikkelsen 11-14H	33-061-03585		
Ringer 14-21TFH	33-025-02659		
Trinity 14-21H	33-025-02658		
Wilhelm 24-21TFH	33-025-02660		
Ulmer 24-21H	33-025-02661		
Martinez USA 24-8H	33-025-03025		
Crosby USA 41-6H	33-025-03005		
Eagle USA 41-5H	33-025-01867		
Clarks Creek USA 14-35H	33-053-06865		
Charmaine USA 14-35TFH	33-053-06864		
Heather USA 13-35TFH	33-053-06867		
Juanita USA 13-35H	33-053-06868		
Raymond USA 41-4H	33-061-01068		
Maggie USA 21-4H	33-061-03527		
Hannah USA 31-4TFH	33-061-03528		
Rufus USA 21-4TFH	33-061-03526		
Goldberg USA 24-33TFH	33-061-03523		

Appendix A -- List of Affected Facilities Sites

Well/Facility Name	API Number	Latitude	Longitude
Anton 34-33TFH	33-061-03525	(b) (9)	(b) (9)
Gaynor 34-33H	33-061-03524		
Ronald 34-33TFH-2B	33-061-03804		
Ladonna Klatt 24-22H	33-025-00733		
Mattie 14-22TFH	33-025-02515		
Hollingsworth 24-22TFH	33-025-02516		
Darvey Klatt 44-22H	33-025-00921		
Arden USA 14-9TFH	33-053-07508		
Iron Woman USA 14-9H	33-053-07921		
Reno USA 24-9TFH-2B	33-053-07506		
Garness USA 31-4TFH-2B	33-053-07474		
Marcella USA 21-4TFH	33-053-07473		
Cunningham USA 31-4H	33-053-07475		
Lacey USA 11-5H	33-061-03754		
Trotter 14-23H	33-025-00684		
Pelton 24-31H	33-025-00760		
Darcy 34-32H	33-025-00642		
Larry Repp 31-6H	33-025-00720		
Oneil 24-24H	33-025-00770		
Oneil 34-24H	33-025-00830		
Marlin 24-12H	33-025-00579		
Hondo 34-12TFH	33-025-03257		
Quill 34-11H	33-025-00810		
Repp 34-34H	33-025-00655		
Oscar Stohler 41-4H	33-025-00610		

Appendix A -- List of Affected Facilities Sites

Well/Facility Name	API Number	Latitude	Longitude		
Mittelstadt 34-12H	33-025-03256	(b) (9)	(b) (9)		
Fred Hansen 34-8H	33-025-00749				
Mary Hansen 14-9H	33-025-00693				
Moline 14-32H	33-061-03755				
Kermit USA 14-9H	33-053-07507				
Grady USA 21-4H	33-053-07472				
Homme 11-18TFH	33-061-04007				
Charchenko 14-21H	33-025-00797				
Beck 14-8H	33-025-00649				
Kukla 34-34H	33-025-00606				
Double H 34-8TFH	33-025-02691				
Stark 44-35TFH	33-061-03725				
Tescher 11-27H	33-025-01071				
Clarice USA 14-9H	33-025-02687				
Shrader 41-13H	33-061-04004				
Brush 24-8H	33-025-02832				
Harley 14-36TFH	33-061-04002				
WM & Agnes Scott 14-25H	33-025-00818				
Torrison 24-8TFH	33-025-02831				
Lund 44-35H	33-061-04001				
Appledoorn 14-19H	33-025-00692				
Christensen 34-33H	33-025-00699				
Beck 24-8H	33-025-00636				
Houser 14-36H	33-061-04003				
French 31-15TFH	33-025-03262				

Appendix A -- List of Affected Facilities Sites

Well/Facility Name	API Number	Latitude	Longitude
Voigt 11-15H	33-025-00700	(b) (9)	(b) (9)
Kemp Trust	33-025-00870		
21-14H			
Chapman 31-15H	33-025-03263		
Spring 21-15TFH	33-025-03264		
Forsman USA 44-22H	33-053-07703		
Lockwood USA 44-22TFH	33-053-07704		
Lena USA 14-22H	33-053-07922		
Murphy 34-22TFH-2B	33-053-07705		
Veronica 14-22TFH	33-053-06520		
Begola USA 34-22H	33-053-07706		
Tat USA 14-22H	33-053-06658		
Tat USA 34-22H	33-053-03182		
Rough Coulee USA 24-22TFH	33-053-06521		
Deane USA 24-22H	33-053-06522		
Arkin 44-12TFH	33-025-03294		
BLUE CREEK 24-22TFH-2B	33-053-06518		
Bronett 14-7H	33-025-03293		
Ernst 14-7TFH	33-025-03267		
Kenneth 24-7TFH	33-025-03268		
Stroup 34-7TFH	33-025-03270		
Bethol 34-7H	33-025-03269		
Chauncey USA 31-2H	33-053-07956		
June USA 31-2H	33-053-07958		
Hunts Along USA 12-1H	33-053-03083		
Wilbur USA 31-2TFH	33-053-07957		

Appendix A -- List of Affected Facilities Sites

Well/Facility Name	API Number	Latitude	Longitude
Mark USA 11-1H	33-053-07990	(b) (9)	(b) (9)
Winona USA 21-2TFH-2B	33-053-07955		
Shoots USA 41-2H	33-053-07988		
Miles 41-2TFH-2B	33-053-07959		
Mamie USA 21-11TFH	33-053-07989		
Demaray USA 41-2TFH	33-053-07693		
Bear Den 42-5TFH	33-025-01773		
Timothy USA 11-1TFH-2B	33-053-07991		
Struthers USA 41-5H	33-025-03124		
Ross 42-5H	33-025-01774		
Ryan 42-5TFH	33-025-03123		
Hillesland 31-3TFH	33-025-02792		
Rita 41-3TFH	33-025-03310		
Stanton 41-3H	33-025-03309		
Olea 24-11TFH	33-025-03305		
Sundby 24-11TFH	33-025-03307		
Marlene 34-11TFH	33-025-03282		
Hugo 34-11H	33-025-03279		
Chimney Butte 34-11H	33-025-00804		
Gravel Coulee 14-11TFH	33-025-03311		
McFadden 14-11H	33-025-03304		
Morrison 24-11H	33-025-03306		
Gifford 34-11TFH	33-025-03280		
Tipton 34-11H	33-025-03281		
Kattevold USA 14-34TFH	33-061-04052		

Appendix A -- List of Affected Facilities Sites

Well/Facility Name	API Number	Latitude	Longitude
Alexander USA 44-33TFH	33-061-04050	(b) (9)	(b) (9)
Pfundheller USA 44-33H	33-061-04051		
Colvin USA 14-34TFH	33-061-03831		
Ranger USA 24-34TFH	33-061-03833		
Lois USA 14-34H	33-061-04055		

Appendix B – Affected Facility Information

Well/Facility Name	Well	Centrifugal	Reciprocating Compressor	Pneumatic Controller	Pneumatic Pump	Storage Vessel	Fugitive Emissions Components
Bingo 24-10TFH	Yes	No	No	No	No	Yes	Yes
Marjorie 14-10H	Yes	No	No	No	No	Yes	Yes
JL Shobe 24- 10TFH	Yes	No	No	No	No	Yes	Yes
Charlie 24-10H	Yes	No	No	No	No	Yes	Yes
Mikkelsen 11- 14H	Yes	No	No	No	No	Yes	Yes
Ringer 14-21TFH	Yes	No	No	No	No	Yes	Yes
Trinity 14-21H	Yes	No	No	No	No	Yes	Yes
Wilhelm 24- 21TFH	Yes	No	No	No	No	Yes	Yes
Ulmer 24-21H	Yes	No	No	No	No	Yes	Yes
Martinez USA 24- 8H	Yes	No	No	No	No	Yes	Yes
Crosby USA 41- 6H	Yes	No	No	No	No	Yes	Yes
Eagle USA 41-5H	Yes	No	No	No	No	Yes	Yes
Clarks Creek USA 14-35H	Yes	No	No	No	No	Yes	Yes

Well/Facility Name	Well	Centrifugal	Reciprocating	Pneumatic Controller	Pneumatic Pump	Storage Vessel	Fugitive Emissions Components
Charmaine USA 14-35TFH	Yes	No	No	No	No	Yes	Yes
Heather USA 13- 35TFH	Yes	No	No	No	No	Yes	Yes
Juanita USA 13- 35H	Yes	No	No	No	No	Yes	Yes
Raymond USA 41-4H	Yes	No	No	No	No	Yes	Yes
Maggie USA 21- 4H	Yes	No	No	No	No	Yes	Yes
Hannah USA 31- 4TFH	Yes	No	No	No	No	Yes	Yes
Rufus USA 21- 4TFH	Yes	No	No	No	No	Yes	Yes
Goldberg USA 24-33TFH	Yes	No	No	No	No	Yes	Yes
Anton 34-33TFH	Yes	No	No	No	No	Yes	Yes
Gaynor 34-33H	Yes	No	No	No	No	Yes	Yes
Ronald 34- 33TFH-2B	Yes	No	No	No	No	Yes	Yes
Ladonna Klatt 24- 22H	Yes	No	No	No	No	Yes	Yes
Mattie 14-22TFH	Yes	No	No	No	No	Yes	Yes

Well/Facility Name	Well	Centrifugal Compressor	Reciprocating Compressor	Pneumatic Controller	Pneumatic Pump	Storage Vessel	Fugitive Emissions Components
Hollingsworth 24-22TFH	Yes	No	No	No	No	Yes	Yes
Darvey Klatt 44- 22H	Yes	No	No	No	No	Yes	Yes
Arden USA 14- 9TFH	Yes	No	No	No	No	Yes	Yes
Iron Woman USA 14-9H	Yes	No	No	No	No	Yes	Yes
Reno USA 24- 9TFH-2B	Yes	No	No	No	No	Yes	Yes
Garness USA 31- 4TFH-2B	Yes	No	No	No	No	Yes	Yes
Marcella USA 21- 4TFH	Yes	No	No	No	No	Yes	Yes
Cunningham USA 31-4H	Yes	No	No	No	No	Yes	Yes
Lacey USA 11-5H	Yes	No	No	No	No	Yes	Yes
Trotter 14-23H	Yes	No	No	No	No	Yes	Yes
Pelton 34-31H	Yes	No	No	No	No	Yes	Yes
Darcy 34-32H	Yes	No	No	No	No	Yes	Yes

Appendix B - Affected Facility Information

Well/Facility Name	Well	Centrifugal Compressor	Reciprocating	Pneumatic Controller	Pneumatic Pump	Storage Vessel	Fugitive Emissions Components
Larry Repp 31-6H	Yes	No	No	No	No	No	Yes
Oneil 24-24H	Yes	No	No	No	No	Yes	Yes
Oneil 34-24H	Yes	No	No	No	No	Yes	Yes
Marlin 24-12H	Yes	No	No	No	No	Yes	Yes
Hondo 34-12TFH	Yes	No	No	No	No	Yes	Yes
Quill 34-11H	Yes	No	No	No	No	No	Yes
Repp 34-34H	Yes	No	No	No	No	Yes	Yes
Oscar Stohler 41- 4H	Yes	No	No	No	No	Yes	Yes
Mittelstadt 34- 12H	Yes	No	No	No	No	Yes	Yes
Fred Hansen 34- 8H	Yes	No	No	No	No	Yes	Yes
Repp Trust 34-9H	Yes	No	No	No	No	No	Yes
Mary Hansen 14- 9H	Yes	No	No	No	No	No	Yes

Well/Facility Name	Well	Centrifugal Compressor	Reciprocating Compressor	Pneumatic Controller	Pneumatic Pump	Storage Vessel	Fugitive Emissions Components
Moline 14-32H	Yes	No	No	No	No	Yes	Yes
Kermit USA 14- 9H	Yes	No	No	No	No	Yes	Yes
Grady USA 21-4H	Yes	No	No	No	No	Yes	Yes
Homme 11- 18TFH	Yes	No	No	No	No	No	Yes
Charchenko 14- 21H	Yes	No	No	No	No	No	Yes
Beck 14-8H	Yes	No	No	No	No	Yes	Yes
Kukla 34-34H	Yes	No	No	No	No	Yes	Yes
Double H 34- 8TFH	Yes	No	No	No	No	Yes	Yes
STARK 44-35TFH	Yes	No	No	No	No	Yes	Yes
Tescher 11-27H	Yes	No	No	No	No	Yes	Yes
Clarice USA 14- 9H	Yes	No	No	No	No	Yes	Yes
Shrader 41-13H	Yes	No	No	No	No	No	Yes

Well/Facility Name	Well	Centrifugal Compressor	Reciprocating Compressor	Pneumatic Controller	Pneumatic Pump	Storage Vessel	Fugitive Emissions Components
Brush 24-8H	Yes	No	No	No	No	Yes	Yes
HARLEY 14-36TFH	Yes	No	No	No	No	Yes	Yes
WM & Agnes Scott 14-25H	Yes	No	No	No	No	No	Yes
Torrison 24-8TFH	Yes	No	No	No	No	Yes	Yes
Lund 44-35H	Yes	No	No	No	No	Yes	Yes
Appledorn 14- 19H	Yes	No	No	No	No	Yes	Yes
Christensen 34- 33H	Yes	No	No	No	No	Yes	Yes
Beck 24-8H	Yes	No	No	No	No	Yes	Yes
Houser 14-36H	Yes	No	No	No	No	Yes	Yes
French 31-15TFH	Yes	No	No	No	No	Yes	Yes
Voigt 11-15H	Yes	No	No	No	No	Yes	Yes
Kempf Trust 21-14H	Yes	No	No	No	No	Yes	Yes

Well/Facility Name	Well	Centrifugal	Reciprocating Compressor	Pneumatic Controller	Pneumatic Pump	Storage Vessel	Fugitive Emissions Components
Chapman 31-15H	Yes	No	No	No	No	Yes	Yes
Spring 21-15TFH	Yes	No	No	No	No	Yes	Yes
Forsman USA 44- 22H	Yes	No	No	No	No	Yes	Yes
Lockwood USA 44-22TFH	Yes	No	No	No	No	Yes	Yes
Lena USA 14-22H	Yes	No	No	No	No	Yes	Yes
Murphy 34- 22TFH-2B	Yes	No	No	No	No	Yes	Yes
Veronica 14- 22TFH	Yes	No	No	No	No	Yes	Yes
Begola USA 34- 22H	Yes	No	No	No	No	Yes	Yes
Tat USA 14-22H	Yes	No	No	No	No	Yes	Yes
Tat USA 34-22H	Yes	No	No	No	No	Yes	Yes
Rough Coulee USA 24-22TFH	Yes	No	No	No	No	Yes	Yes
Deane USA 24- 22H	Yes	No	No	No	No	Yes	Yes

Well/Facility Name	Well	Centrifugal	Reciprocating	Pneumatic Controller	Pneumatic Pump	Storage Vessel	Fugitive Emissions Components
Arkin 44-12TFH	Yes	No	No	No	No	Yes	Yes
BLUE CREEK 24-22TFH-2B	Yes	No	No	No	No	Yes	Yes
Bronett 14-7H	Yes	No	No	No	No	Yes	Yes
Ernst 14-7TFH	Yes	No	No	No	No	Yes	Yes
Kenneth 24-7TFH	Yes	No	No	No	No	Yes	Yes
Stroup 34-7TFH	Yes	No	No	No	No	Yes	Yes
Bethol 34-7H	Yes	No	No	No	No	Yes	Yes
Chauncey USA 31- 2H	Yes	No	No	No	No	Yes	Yes
June USA 31-2H	Yes	No	No	No	No	Yes	Yes
Hunts Along USA 12-1H	Yes	No	No	No	No	Yes	Yes
Wilbur USA 31- 2TFH	Yes	No	No	No	No	Yes	Yes
Mark USA 11-1H	Yes	No	No	No	No	Yes	Yes

Well/Facility Name	Well	Centrifugal	Reciprocating	Pneumatic Controller	Pneumatic Pump	Storage Vessel	Fugitive Emissions Components
Winona USA 21-2TFH-2B	Yes	No	No	No	No	Yes	Yes
Shoots USA 41- 2H	Yes	No	No	No	No	Yes	Yes
Miles 41-2TFH- 2B	Yes	No	No	No	No	Yes	Yes
Mamie USA 21- 11TFH	Yes	No	No	No	No	Yes	Yes
Demaray USA 41- 2TFH	Yes	No	No	No	No	Yes	Yes
Bear Den 42- STFH	Yes	No	No	No	No	Yes	Yes
Timothy USA 11-1TFH-2B	Yes	No	No	No	No	Yes	Yes
Struthers USA 41-5H	Yes	No	No	No	No	Yes	Yes
Ross 42-5H	Yes	No	No	No	No	Yes	Yes
Ryan 42-5TFH	Yes	No	No	No	No	Yes	Yes
Hillesland 31- 3TFH	Yes	No	No	No	No	Yes	Yes
Rita 41-3TFH	Yes	No	No	No	No	Yes	Yes

Well/Facility Name	Well	Centrifugal	Reciprocating Compressor	Pneumatic Controller	Pneumatic Pump	Storage Vessel	Fugitive Emissions Components
Stanton 41-3H	Yes	No	No	No	No	Yes	Yes
Olea 24-11TFH	Yes	No	No	No	No	Yes	Yes
Sundby 24-11TFH	Yes	No	No	No	No	Yes	Yes
Marlene 34- 11TFH	Yes	No	No	No	No	Yes	Yes
Hugo 34-11H	Yes	No	No	No	No	Yes	Yes
Chimney Butte 34-11H	Yes	No	No	No	No	Yes	Yes
Gravel Coulee 14-11TFH	Yes	No	No	No	No	Yes	Yes
McFadden 14- 11H	Yes	No	No	No	No	Yes	Yes
Morrison 24-11H	Yes	No	No	No	No	Yes	Yes
Gifford 34-11TFH	Yes	No	No	No	No	Yes	Yes
Tipton 34-11H	Yes	No	No	No	No	Yes	Yes
Kattevold USA 14-34TFH	Yes	No	No	No	No	Yes	Yes

Well/Facility Name	Well	Compressor	Reciprocating	Pneumatic Controller	Pneumatic Pump	Storage Vessel	Fugitive Emissions Components
Alexander USA 44-33TFH	Yes	No	No	No	No	TBD	Yes
Pfundheller USA 44-33H	Yes	No	No	No	No	TBD	Yes
Colvin USA 14- 34TFH	Yes	No	No	No	No	TBD	Yes
Ranger USA 24- 34TFH	Yes	No	No	No	No	TBD	Yes
Lois USA 14-34H	Yes	No	No	No	No	TBD	Yes

Appendix C - Well Completions with Hydraulic Fracturing

Well/Facility Name	API Number	Date and Time Flowback Onset	Date and Time of Flowback to Separator	Date and Time Flowback Ended	Duration of Flowback	Duration and Disposition Recovery/Combustion/ Venting
Moline 14-32H	33-061-03755	8/4/2017 16:00	8/4/2017 16:00	8/8/2017 05:00	110 hours	Combustion for 110 hours
Kermit USA 14-9H	33-053-07507	8/3/2017 03:00	8/3/2017 03:00	8/11/2017 05:00	201 hours	Combustion for 201 hours
Grady USA 21-4H	33-053-07472	8/10/2017 10:00	8/10/2017 10:00	8/19/2017 05:00	291 hours	Combustion for 215 hours
Homme 11-18TFH	33-061-04007	8/19/2017 14:30	8/19/2017 14:30	8/25/2017 05:00	158.5 hours	Gas Sales and Combustion for 158.5 hours
Charchenko 14-21H	33-025-00797	8/23/2017 16:00	8/23/2017 16:00	8/29/2017 05:00	159 hours	Gas Sales and Combustion for 159 hours
Beck 14-8H	33-025-00649	8/26/2017 14:00	8/26/2017 14:00	9/8/2017 05:00	326 hours	Combustion for 326 hours
Kukla 34-34H	33-025-00606	9/15/2017 07:00	9/15/2017 07:00	9/22/2017 05:00	185 hours	Combustion for 185 hours
Double H 34-8TFH	33-025-02691	9/9/2017 14:30	9/9/2017 14:30	9/28/2017 05:00	381 hours	Combustions for 381 hours
Stark 44-35TFH	33-061-03725	9/23/2017 05:00	9/23/2017 05:00	9/30/2017 12:00	157 hours	Combustion for 157 hours
Tescher 11-27H	33-025-01071	9/21/2017 06:45	9/21/2017 06:45	10/1/2017 05:00	221 hours	Gas Sales and Combustion for 221 hours
Clarice USA 14-9H	33-025-02687	9/7/2017 16:00	9/7/2017 16:00	10/1/2017 05:00	517.5 hours	Combustion for 517.5 hours
Shrader 41-13H	33-061-04004	8/28/2017 06:00	8/28/2017 06:00	9/30/2017 13:00	629 hours	Gas sales and Combustion for 629 hours

Appendix C - Well Completions with Hydraulic Fracturing

Well/Facility Name	API Number	Date and Time Flowback Onset	Date and Time of Flowback to Separator	Date and Time Flowback Ended	Duration of Flowback	Duration and Disposition Recovery/Combustion/
Brush 24-8H	33-025-02832	9/1/2017 12:00	9/1/2017 12:00	10/2/2017 05:00	597 hours	Combustion for 597 hours
Harley 14-36TFH	33-061-04002	9/27/2017 11:30	9/27/2017 11:30	10/4/2017 05:00	186 hours	Combustion for 186 hours
WM & Agnes Scott 14-25H	33-025-00818	10/4/2017 6:00	10/4/2017 6:00	10/9/2017 10:00	119 hours	Combustion for 119 hours
Torrison 24-8TFH	33-025-02831	9/30/2017 11:40	9/30/2017 11:40	10/10/2017 05:00	255 hours	Combustion for 255 hours
Lund 44-35H	33-061-04001	9/30/2017 18:00	9/30/2017 18:00	10/11/2017 05:00	266 hours	Combustion for 266 hours
Appledorn 14-19H	33-025-00692	10/8/2017 15:00	10/8/2017 15:00	10/16/2017 05:00	201 hours	Combustion for 201 hours
Christensen 34- 33H	33-025-00699	10/6/2017 10:00	10/6/2017 10:00	10/17/2017 05:00	278 hours	Combustion for 278 hours
Beck 24-8H	33-025-00636	10/4/2017 08:00	10/4/2017 08:00	10/18/2017 05:00	352 hours	Combustion for 352 hours
Houser 14-36H	33-061-04003	10/4/2017 04:00	10/4/2017 04:00	10/27/2017 07:00	537 hours	Combustion for 537 hours
French 31-15TFH	33-025-03262	10/18/2017 08:30	10/18/201 7 08:30	10/27/2017	237 hours	Combustion for 237 hours
Voigt 11-15H	33-025-00700	10/11/2017 04:00	10/11/201 7 04:00	10/30/2017 05:00	476 hours	Combustion for 476 hours
Kemp Trust 21-14H	33-025-00870	10/25/2017 14:00	10/25/201 7 14:00	11/5/2017 05:00	281 hours	Combustion for 281 hours
Chapman 31-15H	33-025-03263	10/14/2017 07:00	10/14/201 7 07:00	11/8/2017 05:00	595 hours	Combustion for 595 hours

Appendix C - Well Completions with Hydraulic Fracturing

Well/Facility Name			0			
	API Number	Date and Time Flowback Onset	Date and Time of Flowback to Separator	Date and Time Flowback Ended	Duration of Flowback	Duration and Disposition Recovery/Combustion/
Spring 21-15TFH	33-025-03264	11/4/2017 10:00	11/4/2017 10:00	11/20/2017 05:00	399 hours	Combustion for 399 hours
Forsman USA 44-22H	33-053-07703	12/5/2017 09:00	12/5/2017 09:00	12/15/2017 05:00	260 hours	Combustion for 260 hours
Lockwood USA 44-22TFH	33-053-07704	12/10/2017 08:30	12/10/2017 08:30	12/21/2017 05:00	281 hours	Combustion for 281 hours
Lena USA 14-22H	33-053-07922	12/18/2017 01:00	12/18/2017 01:00	12/22/2017 05:00	92 hours	Combustion for 92 hours
Murphy 34-22TFH-2B	33-053-07705	12/13/2017 12:30	12/13/20171 12:30	12/27/2017 05:00	347 hours	Combustion for 347 hours
Veronica 14-22TFH	33-053-06520	12/16/2018 0:00	12/16/2018 0:00	12/27/2018 05:00	269 hours	Combustion for 269 hours
Begola USA 34-22H	33-053-07706	12/22/2017 16:30	12/22/2017 16:30	1/6/2018 05:00	353.5 hours	Combustion for 353.5 hours
Tat USA 14-22H	33-053-06658	12/23/2017 14:00	12/23/2017 14:00	1/6/2018 05:00	345.5 hours	Combustion for 353.5 hours
Tat USA 34-22H	33-053-03182	11/29/2017 13:50	11/29/2017 13:50	1/9/2018 05:00	296.65 hours	Combustion for 296.65 hours
Rough Coulee USA 24-22TFH	33-053-06521	12/29/2017 21:00	12/29/2017 21:00	1/11/2018 05:00	313.5 hours	Combustion for 296.65 hours
Deane USA 24-22H	33-053-06522	12/24/2017 17:00	12/24/2017 17:00	1/16/2018 05:00	516 hours	Combustion for 516 hours
Arkin 44-12TFH	33-025-03294	1/15/2018 08:15	1/15/2018 08:15	1/23/2018 05:00	211.25 hours	Combustion for 211.25 hours
Blue Creek 24-22TFH-2B	33-053-06518	1/18/2018 10:00	1/18/2018 10:00	1/24/2018 05:00	163 hours	Combustion for 163 hours
Bronett 14-7H	33-025-03293	1/24/2018 12:00	1/24/2018 12:00	2/1/2018 05:00	181.75 hours	Gas Sales and Combustion for 181.75

Appendix C - Well Completions with Hydraulic Fracturing

Well/Facility Name	API Number	Date and Time Flowback Onset	Date and Time of Flowback to Separator	Date and Time Flowback Ended	Duration of Flowback	Duration and Disposition Recovery/Combustion/ Venting
Ernst 14-7TFH	33-025-03267	1/28/2018 12:15	1/28/2018 12:15	2/12/2018 05:00	366.25 hours	Gas Sales and Combustion for 366.25
Kenneth 24-7TFH	33-025-03268	1/31/2018 13:00	1/31/2018 13:00	2/15/2018 05:00	371 hours	Gas Sales and Combustion for 371 hours
Stroup 34-7TFH	33-025-03270	1/31/2018 13:30	1/31/2018 13:30	2/16/2018 05:00	394.5 hours	Gas Sales and Combustion for 394.5 hours
Bethol 34-7H	33-025-03269	2/9/2017 09:30	2/9/2017 09:30	2/27/2017 05:00	451.5 hours	Gas Sales and Combustion for 451.5 hours
Chauncey USA 31-2H	33-053-07956	3/15/2018 15:00	3/15/2018 15:00	3/29/2018 05:00	315.7 hours	Gas Sales and Combustion for 315.7 hours
June USA 31-2H	33-053-07958	3/18/2018 08:00	3/18/2018 08:00	4/1/2018 05:00	323.25 hours	Gas Sales and Combustion for 323.25 hours
Hunts Along USA 12-1H	33-053-03083	3/26/2018 12:00	3/26/2018 08:00	4/12/2018 05:00	247 hours	Gas Sales and Combustion for 247 hours
Wilbur USA 31-2TFH	33-053-07957	3/30/2018 09:00	3/30/2018 09:00	4/12/2018 05:00	332.5 hours	Gas Sales and Combustion for 332 hours

Appendix C - Well Completions with Hydraulic Fracturing

Well/Facility Name	API Number	Date and Time Flowback Onset	Date and Time of Flowback to Separator	Date and Time Flowback Ended	Duration of Flowback	Duration and Disposition Recovery/Combustion/ Venting
Mark USA 11-1H	33-053-07990	3/30/2018 09:00	3/30/2018 09:00	4/12/2018 05:00	333 hours	Combustion for 333 hours
Winona USA 21-2TFH-2B	33-053-07955	4/2/2018 12:00	4/2/2018 12:00	4/16/2018 05:00	348 hours	Gas Sales and Combustion for 348 hours
Shoots USA 41-2H	33-053-07988	4/2/2018 12:00	4/2/2018 12:00	4/17/2018 05:00	373.5 hours	Combustion for 373.5 hour
Miles 41-2TFH-2B	33-053-07959	4/7/2018 07:00	4/7/2018 07:00	4/24/2018 05:00	425 hours	Gas Sales and Combustion for 348 hours
Mamie USA 21-11TFH	33-053-07989	4/14/2018 09:15	4/14/2018 09:15	4/27/2018 05:00	307 hours	Gas Sales and Combustion for 307 hours
Demaray USA 41-2TFH	33-053-07693	4/20/2018 09:00	4/20/2018 09:00	5/2/2018 05:00	272 hours	Gas Sales and Combustion for 272 hours
Bear Den 42-5TFH	33-025-01773	4/24/2018 12:30	4/24/2018 12:30	5/1/2018 08:00	134 hours	Gas Sales and Combustion for 134 hours
Timothy USA 11-1TFH-2B	33-053-07991	4/20/2018 08:30	4/20/2018 08:30	5/30/2018 05:00	947.4 hours	Gas Sales and Combustion for 947.4 hours
Struthers USA 41-5H	33-025-03124	5/2/2018 09:00	5/2/2018 09:00	5/15/2018 05:00	299.5 hours	Combustion for 299.5 hours
Ross 42-5H	33-025-01774	5/4/2018 13:30	5/4/2018 13:30	5/19/2018 05:00	345 hours	Combustion for 345 hours

Appendix C – Well Completions with Hydraulic Fracturing

Well/Facility Name		ack	back	ack	×	lon /u
	API Number	Date and Time Flowback Onset	Date and Time of Flowback to Separator	Date and Time Flowback Ended	Duration of Flowback	Duration and Disposition Recovery/Combustion/ Venting
Ryan 42-5TFH	33-025-03123	5/15/2018 12:30	5/15/2018 12:30	5/24/2018 05:00	206.5 hours	Combustion for 296.5 hours
Hillesland 31-3TFH	33-025-02792	5/9/2018 18:45	5/9/2018 18:45	5/24/2018 10:00	242.2 5 hours	Combustion for 242.25 hours
Rita 41-3TFH	33-025-03310	5/20/2018 14:00	5/20/2018 14:00	6/3/2018 05:00	327 hours	Combustion for 327 hours
Stanton 41-3H	33-025-03309	5/25/2018 17:15	5/25/2018 17:15	6/9/2018 05:00	347.2 5 hours	Combustion for 347.25 hours
Olea 24-11TFH	33-025-03305	6/2/2018 17:00	6/2/2018 17:00	6/14/2018 12:00	283.0 0 hours	Combustion for 283 hours
Sundby 24-11TFH	33-025-03307	6/4/2018 08:30	6/4/2018 08:30	6/18/2018 05:00	347.5 0 hours	Combustion for 347.50 hours
Marlene 34-11TFH	33-025-03282	6/10/2018 11:00	6/10/2018 11:00	6/21/2018 05:00	258.5 hours	Combustion for 258.5 hours
Hugo 34-11H	33-025-03279	6/21/2018 14:00	6/21/2018 14:00	6/28/2018 05:00	178 hours	Combustion for 178 hours
Chimney Butte 34- 11H	33-025-00804	6/6/2018 15:50	6/6/2018 15:50	6/28/2018 13:00	487.5 hours	Combustion for 487.5 hours
Gravel Coulee 14- 11TFH	33-025-03311	6/15/2018 12:00	6/15/2018 12:00	7/1/2018 00:00	396 hours	Combustion for 396 hours
McFadden 14-11H	33-025-03304	6/20/2018 14:00	6/20/2018 14:00	7/5/2018 05:00	351 hours	Combustion for 351 hours

Appendix C - Well Completions with Hydraulic Fracturing

Well/Facility Name	API Number	Date and Time Flowback Onset	Date and Time of Flowback to Separator	Date and Time Flowback Ended	Duration of Flowback	Duration and Disposition Recovery/Combustion/
Morrison 24-11H	33-025-03306	6/18/2018 08:00	6/18/2018 08:00	7/6/2018 05:00	412 hours	Combustion for 412 hours
Gifford 34-11TFH	33-025-03280	6/21/2018 14:00	6/21/2018 14:00	7/7/2018 00:00	394 hours	Combustion for 412 hours
Tipton 34-11H	33-025-03281	6/28/2018 14:00	6/28/2018 14:00	7/7/2018 03:00	201 hours	Combustion for 201 hours
Kattevold USA 14-34TFH	33-061-04052	7/11/2018 07:00	7/11/2018 07:00	7/21/2018 03:00	227.5 hours	Combustion for 227.5 hours
Alexander USA 44-33TFH	33-061-04050	7/7/2018 07:00	7/7/2018 07:00	7/25/2018 05:00	422 hours	Combustion for 422 hours
Pfundheller USA 44-33H	33-061-04051	7/21/2018 14:00	7/21/2018 14:00	7/31/2018 03:00	229 hours	Combustion for 229 hours
Colvin USA 14-34TFH	33-061-03831	7/20/2018 08:00	7/20/2018 08:00	8/1/2018 03:00	298 hours	Combustion for 298 hours
Ranger USA 24-34TFH	33-061-03833	7/23/2018 08:00	7/23/2018 08:00	8/8/2018 05:00	368.5 hours	Combustion for 368 hours
Lois USA 14-34H	33-061-04055	7/27/2018 09:00	7/27/2018 09:00	8/9/2018 05:00	315.75 hours	Combustion for 315.75 hours

Appendix D - Storage Vessel Affected Facilities

Well/Facility Name	Latitude	Longitude (b) (9)	
Bingo Pad	(b) (9)		
Mikkelsen Pad			
Martinez USA Pad			
Ringer Pad			
Eagle USA Pad			
Clarks Creek USA Pad			
Raymond USA Pad			
Goldberg USA Pad			
Ladonna Klatt CTB			
Kermit USA Pad			
Trotter 14-23H			
Pelton 24-31H			
Darcy Pad			
Oneil 24-24H			
Oneil 34-24H			
Marlin 14 Pad			
Mary Hansen 14-9H			
Fred Hansen 34-8H			
Quill 34-11H			
Repp 34-34H			
Oscar Stohler 41-4H			

Appendix D – Storage Vessel Affected Facilities

Well/Facility Name	Latitude	Longitude	
Moline Pad	(b) (9)	(b) (9)	
Grady USA Pad			
William Kukla CTB			
Beck Pad CTB			
Big Head Pad (Stark CTB)			
Tescher 11-27H			
Delia USA Pad			
Appledoorn 14-19H			
Christensen 34-33H			
Chapman CTB			
Voigt 11-15H			
Kempf Trust 21-14H			
TAT USA 34 Pad			
Veronica USA Pad			
Bethol CTB			
Sherman USA Pad			
Hunts Along USA Pad			
Bear Den Pad			
Stohler 41 CTB			
Earl Pennington USA Pad (Kattevold CTB)			

Appendix E- Storage Vessel Affected	Facility VOC Emission Rate De	terminations

Completion Name	Field	Date	Down Time Hours(1)	Actual Oil Production
Appledoorn 14-19H	Bailey	10/25/2017	0	235.45701
Appledoorn 14-19H	Bailey	10/26/2017	0	660.17224
Appledoorn 14-19H	Bailey	10/27/2017	0	925.41247
Appledoorn 14-19H	Bailey	10/28/2017	20	586.69333
Appledoorn 14-19H	Bailey	10/29/2017	0	609.60465
Appledoorn 14-19H	Bailey	10/30/2017	0	673.71542
Appledoorn 14-19H	Bailey	10/31/2017	0	712.07529
Appledoorn 14-19H	Bailey	11/1/2017	0	723.8894581
Appledoorn 14-19H	Bailey	11/2/2017	0	744.15339
Appledoorn 14-19H	Bailey	11/3/2017	0	794.5719896
Appledoorn 14-19H	Bailey	11/4/2017	0	867.2822222
Appledoorn 14-19H	Bailey	11/5/2017	0	665.2126783
Appledoorn 14-19H	Bailey	11/6/2017	0	762.8264622
Appledoorn 14-19H	Bailey	11/7/2017	0	626.8413788
Appledoorn 14-19H	Bailey	11/8/2017	0	564.757465
Appledoorn 14-19H	Bailey	11/9/2017	0	699.0567161
Appledoorn 14-19H	Bailey	11/10/2017	0	608.6959788
Appledoorn 14-19H	Bailey	11/11/2017	4	573.2978615
Appledoorn 14-19H	Bailey	11/12/2017	0	607.1278464
Appledoorn 14-19H	Bailey	11/13/2017	3	648.4546971
Appledoorn 14-19H	Bailey	11/14/2017	0	637.1506296
Appledoorn 14-19H	Bailey	11/15/2017	0	617.2041761
Appledoorn 14-19H	Bailey	11/16/2017	0	627.0484968
Appledoorn 14-19H	Bailey	11/17/2017	0	631.753366
Appledoorn 14-19H	Bailey	11/18/2017	2	516.739648
Appledoorn 14-19H	Bailey	11/19/2017	2	566.1015671
Appledoorn 14-19H	Bailey	11/20/2017	8	541.7316602
Appledoorn 14-19H	Bailey	11/21/2017	0	634.7707876
Appledoorn 14-19H	Bailey	11/22/2017	8	428.3353633
Appledoorn 14-19H	Bailey	11/23/2017	6.00	646.2398743
	Average -10/25/2017 thro	ough 11/23/2017		637.8791374

Appledoorn 14-19H

NSPS OOOOa Applicability Determination for Storage tanks

Appledoorn 14-19H Well name

637.8791374 Average of first thirty days of production after re-frack, bbl/d

10/18/2017 Date of first production after re-frack

3 Number of oil tanks

7/25/2017 Date of LACT unit installation

0.6 Decline factor

7.22 Storage tank emissions - total

41276-41278 Tank numbers

Completion Name	Field	Date		Down Time Hours(1)	Actual Oil Production
Bear Den CTB	Lost Bridge		5/24/2018	ö	.3401.58
Bear Den CTB	Lost Bridge		5/25/2018	0	3906.50
Bear Den CTB	Lost Bridge		5/26/2018	0	3948.92
Bear Den CTB	Lost Bridge		5/27/2018	0	3723.75
Bear Den CTB	Lost Bridge		5/28/2018	0	2432.83
Bear Den CTB	Lost Bridge		5/29/2018	0	3334.42
Bear Den CTB	Lost Bridge		5/30/2018	0	3188.67
Bear Den CTB	Lost Bridge		5/31/2018	0	2673.17
Bear Den CTB	Lost Bridge		6/1/2018	0	3441.17
Bear Den CTB	Lost Bridge		6/2/2018	0	4320.50
Bear Den CTB	Lost Bridge		6/3/2018	0	4745.42
Bear Den CTB	Lost Bridge		6/4/2018	0	5348.58
Bear Den CTB	Lost Bridge		6/5/2018	0	5032.17
Bear Den CTB	Lost Bridge		6/6/2018	0	4677.33
Bear Den CTB	Lost Bridge		6/7/2018	0	4277.83
Bear Den CTB	Lost Bridge		6/8/2018	0	2955.33
Bear Den CTB	Lost Bridge		6/9/2018	0	2788.75
Bear Den CTB	Lost Bridge		6/10/2018	0	2637.42
Bear Den CTB	Lost Bridge		6/11/2018	0	2670.08
Bear Den CTB	Lost Bridge		6/12/2018	0	2337.17
Bear Den CTB	Lost Bridge		6/13/2018	0	2355.83
Bear Den CTB	Lost Bridge		6/14/2018	0	2510.67
Bear Den CTB	Lost Bridge		6/15/2018	0	2098.23
Bear Den CTB	Lost Bridge		6/16/2018	0	633.19
Bear Den CTB	Lost Bridge		6/17/2018	0	102.58
Bear Den CTB	Lost Bridge		6/18/2018	Ö.	644.65
Bear Den CTB	Lost Bridge		6/19/2018	0	1127.35
Bear-Den CTB	Lost Bridge		6/20/2018	0	1254.42
Bear Den CTB	Lost Bridge		6/21/2018	0	2248.25
Bear Den CTB	Lost Bridge		6/22/2018	0	2952.33
	Average 5/24/201	8 through 6/22/2018			2925.64

Bear Den 42-STFH, Ross 42-5H, Ryan 42-STFH, Struthers USA 41-5H NSPS OOOOa Applicability Determination for Storage tanks

Bear Den CTB Facility Name

2925.64 Average of first thirty days of production

5/24/2018 Date of first production

6 Number of oil tanks

Date of LACT unit installation

0.6 Decline factor

33.12 Storage tank emissions - total

2865-2870 Tank numbers

2868, 2869, 2870 LACT permissive tank

Completion Name	Field	Date		Down Time Hours(1)	Actual Oil Production	
Beck CTB	Bailey		10/19/2017	0	6012.11	
Beck CTB	Bailey		10/20/2017	0	6384.73	
Beck CTB	Bailey		10/21/2017	0	6100.23	
Beck CTB	Bailey		10/22/2017	0	5416.97	
Beck CTB	Bailey		10/23/2017	0	4815.80	
Beck CTB	Bailey		10/24/2017	0	5002.95	
Beck.CTB	Bailey		10/25/2017	0	4988.46	
Beck CTB	Bailey		10/26/2017	0	5143.34	
Beck CTB	Bailey		10/27/2017	0	4416:71	
Beck CTB	Bailey		10/28/2017	0	4267.75	
Beck CTB	Bailey		10/29/2017	0	3390.10	
Beck CTB	Bailey		10/30/2017	0	3610.42	
Beck CTB	Bailey		10/31/2017	0	3810.81	
Beck CTB	Bailey		11/1/2017	0	3969.36	
Beck CTB	Bailey		11/2/2017	0	4348.81	
Beck CTB	Bailey		11/3/2017	0	4103.52	
Beck CTB	Bailey		11/4/2017	0	4032.91	
Beck CTB	Bailey		11/5/2017	0	3934.85	
Beck CTB	Bailey		11/6/2017	0	3707.51	
Beck CTB	Bailey		11/7/2017	0	3470.55	
Beck CTB	Bailey		11/8/2017	0	3071.96	
Beck CTB	Bailey		11/9/2017	0	2046.78	
Beck CTB	Bailey		11/10/2017	0	2430.13	
Beck CTB	Bailey		11/11/2017	0	2107.18	
Beck CTB	Bailey		11/12/2017	0	2592.24	
Beck CTB	Bailey		11/13/2017	0	2649.89	
Beck CTB	Bailey		11/14/2017	0	2731.80	
Beck CTB	Bailey		11/15/2017	0	3223.16	
Beck CTB	Bailey		11/16/2017	0	3293.51	
Beck-CTB	Bailey		11/17/2017	0	3193.65	
	Average -10/1	18/2017 through 11/17/2017			3942.31	

BRU5H 24-8H, BECK 24-8H, BECK 14-8H, DOUBLE H 34-8TFH, HAMMEL 44-8TFH, TORRISON 24-8TFH NSPS OOOOa Applicability Determination for Storage tanks

Beck CTB

Facility Name

3942.31 Average of first thirty days of production after re-frack, bbl/d

10/19/2017 Date of first production after re-frack

12 Number of oil tanks

Date of LACT unit installation

0.6. Decline factor

44.63 Storage tank emissions - total

43999-44010 Tank numbers

Completion Name	Field	Date		Down Time Hours(1)	Actual Oil Produ	ction
Bethol CTB	Bailey		2/28/2018	O	61:	25.02
Bethol CTB	Bailey		3/1/2018	O	61	64.34
Bethol CTB	Bailey		3/2/2018	O	576	63.22
Bethol CTB	Bailey		3/3/2018	O	61.	16.90
Bethol CTB	Bailey		3/4/2018	O	71	93.13
Bethol CTB	Bailey		3/5/2018	C	510	05.13
Bethol CTB	Bailey		3/6/2018	C	424	44.16
Bethol CTB	Bailey		3/7/2018	C	52	34.41
Bethol CTB	Bailey		3/8/2018	C	60:	31.55
Bethol CTB	Bailey		3/9/2018	C	625	57.75
Bethol CT8	Bailey		3/10/2018	C	620	01.51
Bethol CT8	Bailey		3/11/2018	C	598	88.25
8ethol CTB	Bailey		3/12/2018	C	44	60.98
Bethol CTB	Bailey		3/13/2018	C	510	04.13
Bethol CTB	Bailey		3/14/2018	C	32	47.28
Bethal CTB	Bailey		3/15/2018	C	46	D4.32
Bethol CTB	Bailey		3/16/2018	C	46	73.29
Bethol CTB	Bailey		3/17/2018	C	579	99.98
Bethol CTB	Bailey		3/18/2018	C	61	77.99
Bethol CTB	Bailey		3/19/2018	C	66	41.19
Bethol CTB	Bailey		3/20/2018	C	47	10.10
Bethol CTB	Bailey		3/21/2018	C	50	28.89
Bethol CTB	Bailey		3/22/2018	C	65	92.19
Bethol CTB	Bailey		3/23/2018	C	61:	17.85
Bethol CTB	Bailey		3/24/2018	C	55	74.20
Bethol CTB	Bailey		3/25/2018	C	62	47.06
Bethol CTB	Bailey		3/26/2018	C	72	58.50
Bethol CTB	Bailey		3/27/2018	C	49	14.15
Bethol CTB	Bailey		3/28/2018	C	70	01.68
Bethol CTB	Bailey		3/29/2018	C	62	40.59
	Average 12/	15/2017 through 1/13/7/2018			569	93.99

Bethol 34-7H, Stroup 34-7TFH, Kenneth 24-7TFH, Ernst 14-7TFH, Bronnett 14-7H, Arkin 44-1TFH, and Kevin Buehner 31-18H NSPS OOOOa Applicability Determination for Storage tanks

Bethol CTB

Facility Name

5693.99 Average of first thirty days of production

2/28/2018 Date of first production

16 Number of oil tanks

Date of LACT unit Installation

0.6 Decline factor

64.46 Storage tank emissions - total

44021-44036 Tank numbers

44029, 44035, 44036 LACT permissive tank

Completion Name	Field	Date		Down Time Hours(1)	Actual Oil Production
Chapman CTB		11/	21/2017	0	2361.84
Chapman CTB	Reunion Bay	11/	22/2017	0	2330.10
Chapman CTB	Reunion Bay	11/	23/2017	0	2236.65
Chapman CTB	Reunion Bay	11/	24/2017	0	2114.27
Chapman CTB	Reunion Bay	11/	25/2017	0	2071.35
Chapman CTB	Reunion Bay	11/	26/2017	0	1863.71
Chapman CTB	Reunion Bay	11/3	27/2017	0	1741.24
Chapman CTB	Reunion Bay	11/3	28/2017	0	1624.49
Chapman CTB	Reunion Bay	11/3	29/2017	0	1661.80
Chapman CTB	Reunion Bay	11/	30/2017	0	1662.53
Chapman CTB	Reunion Bay	12	/1/2017	0	1636.66
Chapman CTB	Reunion Bay	12	/2/2017	0	1610.95
Chapman CTB	Reunion Bay	12	/3/2017	0	1575.44
Chapman CTB	Reunion Bay	12	/4/2017	0	1579.96
Chapman CTB	Reunion Bay	12	/5/2017	0	1575.26
Chapman CTB	Reunion Bay	12	/6/2017	0	1509.68
Chapman CTB	Reunion Bay	12	/7/2017	0	903.78
Chapman CTB	Reunion Bay	12	/8/2017	0	842.75
Chapman CTB	Reunion Bay	12	/9/2017	0	1573.09
Chapman CTB	Reunion Bay	12/	10/2017	0	1702.87
Chapman CTB	Reunion Bay	12/	11/2017	0	1428.51
Chapman CTB	Reunion Bay	12/	12/2017	0	1517.18
Chapman CTB	Reunion Bay	12/:	13/2017	0	1366.16
Chapman CTB	Reunion Bay	12/	14/2017	0	1404.64
Chapman CTB	Reunion Bay	12/:	15/2017	0	1578.95
Chapman CTB	Reunion Bay	12/:	16/2017	0	1592.93
Chapman CTB	Reunion Bay	12/:	17/2017	0	1507.10
Chapman CTB	Reunion Bay	12/:	18/2017	0	1510.89
Chapman CTB	Reunion Bay	12/:	19/2017	0	1141.23
Chapman CTB	Reunion Bay	12/2	20/2017	0.	1791.16
	Average -11/21/2017 th	hrough 12/20/2017			1633.91

NSPS OOOOa Applicability Determination for Storage tanks

Chapman CTB

Facility Name

1633.91 Average of first thirty days of production after re-frack, bbl/d

11/21/2017 Date of first production after re-frack

9 Number of oil tanks

11/21/2017 Date of LACT unit installation

0.6 Decline factor

18.50 Storage tank emissions - total

44011-44019 Tank numbers

44015, 44019 LACT permissive tank

Completion Name	Field	Date		Down Time Hours(1	1)	Actual Oil Production
Christensen 34-33H	Bailey		10/18/2017	1	0	627.60
Christensen 34-33H	Bailey		10/19/2017		0	909.05
Christensen 34-33H	Bailey		10/20/2017	1	0	773.21
Christensen 34-33H	Bailey		10/21/2017		0	772.87
Christensen 34-33H	Bailey		10/22/2017	1	0	789.44
Christensen 34-33H	Bailey		10/23/2017	1	0	767.62
Christensen 34-33H	Bailey		10/24/2017	1	0	801.41
Christensen 34-33H	Bailey		10/25/2017	!	0	758.89
Christensen 34-33H	Bailey		10/26/2017	(0	766.04
Christensen 34-33H	Bailey		10/27/2017	(0	746.51
Christensen 34-33H	Bailey		10/28/2017	(0	726.60
Christensen 34-33H	Bailey		10/29/2017	!	0	729.62
Christensen 34-33H	Bailey		10/30/2017	1	0	717.95
Christensen 34-33H	Bailey		10/31/2017	(0	698.09
Christensen 34-33H	Bailey		11/1/2017	1	0	684.06
Christensen 34-33H	Bailey		11/2/2017	1	0	671.03
Christensen 34-33H	Bailey		11/3/2017	1	0	670.52
Christensen 34-33H	Bailey		11/4/2017		0	665.21
Christensen 34-33H	Bailey		11/5/2017	1	0	735 .71
Christensen 34-33H	Bailey		11/6/2017	1	0	596.50
Christensen 34-33H	Bailey		11/7/2017	1	0	640.64
Christensen 34-33H	Bailey		11/8/2017		0	634.36
Christensen 34-33H	Bailey		11/9/2017	1	0	625.95
Christensen 34-33H	Bailey		11/10/2017		0	630.86
Christensen 34-33H	Bailey		11/11/2017	1	0	605.19
Christensen 34-33H	Bailey		11/12/2017	1	0	606.80
Christensen 34-33H	Bailey		11/13/2017	1	0	575.66
Christensen 34-33H	Bailey		11/14/2017	i	0	5 75.5 4
Christensen 34-33H	Bailey		11/15/2017	1	0	559.31
Christensen 34-33H	Bailey		11/16/2017	1	0	562.29
	Average -10/	18/2017 through 11/16/2017				687.48

Christensen 34-33H

NSPS OOOOa Applicability Determination for Storage tanks

Christensen 34-33H Well name

687.48 Average of first thirty days of production after re-frack, bbl/d

10/18/2017 Date of first production after re-frack

3 Number of oil tanks

Date of LACT unit Installation

1 Decline factor

12.97 Storage tank emissions - total

41401-41403 Tank numbers

Completion Name	Field	Date		Down Time Hours(1)	Actual Oil Production
Delia CTB	Bailey		10/2/2017	()	2934.25
Delia CTB	Bailey		10/3/2017	()	4603.11
Delia CTB	Bailey		10/4/2017	()	4676.30
Delia CTB	Bailey		10/5/2017	()	4311.03
Delia CTB	Bailey		10/6/2017	()	4001.92
Delia CTB	Bailey		10/7/2017	()	3930.02
Delia CTB	Bailey		10/8/2017	()	3516.95
Delia CTB	Bailey		10/9/2017	()	3600.39
Delia CTB	Bailey		10/10/2017	()	3710.92
Delia CTB	Bailey		10/11/2017	()	3374.35
Delia CTB	Bailey		10/12/2017	()	3289.91
Delia CTB	Bailey		10/13/2017	()	3194.64
Delia CTB	Bailey		10/14/2017	()	3108.42
Delia CTB	Bailey		10/15/2017	()	2641.46
Delia CTB	Bailey		10/16/2017	()	2848.22
Delia CTB	Bailey		10/17/2017	()	3164.72
Delia CTB	Bailey		10/18/2017	()	1822.49
Delia CTB	Bailey		10/19/2017	()	1384.74
Delia CTB	Bailey		10/20/2017	()	1279.69
Delia CTB	Bailey		10/21/2017	()	1556.07
Delia CTB	Bailey		10/22/2017	()	2336.51
Delia CTB	Bailey		10/23/2017	()	2771.38
Delia CTB	Bailey		10/24/2017	()	2261.25
Delia CTB	Bailey		10/25/2017	()	2844.31
Delia CTB	Bailey		10/26/2017	()	2762.46
Delia CTB	Bailey		10/27/2017	()	2654.60
Delia CTB	Bailey		10/28/2017	()	2562.93
Delia CTB	Bailey		10/29/2017	()	2483.98
Delia CTB	Bailey		10/30/2017	()	2328.63
Delia CTB	Bailey		10/31/2017	()	2372.99
	Average -10/2/2017 thi	rough 11/17/2017				2944.29

Delia USA 14-9TFH, Clarice USA 14-9H

NSPS OOOOa Applicability Determination for Storage tanks

Delia CTB

Facility Name

2944.29 Average of first thirty days of production after re-frack, bbl/d

10/2/2017 Date of first production after re-frack

3 Number of oil tanks

10/2/2017 Date of LACT unit installation

0.6 Decline factor

33.33 Storage tank emissions - total

43544-43549 Tank numbers

Completion Name	Field	Date	Down Time Hours(1)	Actual Oil Production
KATTEVOLD USA CTB	Reunuin Bay	8/1/2018	0	4711.86
KATTEVOLD USA CTB	Reunuin Bay	8/2/2018	0	5734.97
KATTEVOLD USA CTB	Reunuin Bay	8/3/2018	0	4726.78
KATTEVOLD USA CTB	Reunuin Bay	8/4/2018	0	5987.60
KATTEVOLD USA CTB	Reunuin Bay	8/5/2018	0	6177.23
KATTEVOLD USA CTB	Reunuin Bay	8/6/2018	0	5341.88
KATTEVOLD USA CTB	Reunuin Bay	8/7/2018	0	6119.18
KATTEVOLD USA CTB	Reunuln Bay	8/8/2018	0	4568.80
KATTEVOLD USA CTB	Reunuin Bay	8/9/2018	0	4934.29
KATTEVOLD USA CTB	Reunuin Bay	8/10/2018	0	2601.39
KATTEVOLD USA CTB	Reunuin Bay	8/11/2018	0	1895.35
KATTEVOLD USA CTB	Reunuin Bay	8/12/2018	0	1961.98
KATTEVOLD USA CTB	Reunuin Bay	8/13/2018	0	1436.23
KATTEVOLD USA CTB	Reunuin Bay	8/14/2018	0	1477.17
KATTEVOLD USA CTB	Reunuin Bay	8/15/2018	0	1636.88
KATTEVOLD USA CTB	Reunuin Bay	8/16/2018	0	1486.73
KATTEVOLD USA CTB	Reunuin Bay	8/17/2018	0	1030.18
KATTEVOLD USA CTB	Reunuin Bay	8/18/2018	0	1529.05
KATTEVOLD USA CTB	Reunuin Bay	8/19/2018	0	1577.30
KATTEVOLD USA CTB	Reunuin Bay	8/20/2018	0	2457.93
KATTEVOLD USA CTB	Reunuin Bay	8/21/2018	0	2750.49
KATTEVOLD USA CTB	Reunuin Bay	8/22/2018	0	2918.10
KATTEVOLD USA CTB	Reunuin Bay	8/23/2018	0	2641.30
KATTEVOLD USA CTB	Reunuin Bay	8/24/2018	0	3280.57
KATTEVOLD USA CTB	Reunuin Bay	8/25/2018	0	6253.80
KATTEVOLD USA CTB	Reunuin Bay	8/26/2018	0	6174.07
KATTEVOLD USA CTB	Reunuin Bay	8/27/2018	0	5695.16
KATTEVOLD USA CTB	Reunuin Bay	8/28/2018	0	5132.99
KATTEVOLD USA CTB	Reunuin Bay	8/29/2018	0	5264.55
KATTEVOLD USA CTB	Reunuin Bay	8/30/2018	0	5054.32
	Average 8/1/2018 throu	· ·		3751.94
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KATTEVOLD USA 14-34TFH, ALEXANDER USA 44-33TFH, PFUNDHELLER USA 44-33H NSPS OOOOa Applicability Determination for Storage tanks

Earl Pennington Pad/ KATTEVOLD USA CTB

Facility Name

3751.94 Average of first thirty days of production

8/1/2018 Date of first production

7 Number of oil tanks

0.5 Decline factor

30.39 Storage tank emissions - total

2888-2894 Tank numbers

2889, 2891, 2893, 2894, LACT permissive tank

Completion Name	Field	Date		Down Time Hou	rs	Actual Oil Production
Hunts Along USA CTB	Antelope		5/31/2018		0	282.72
Hunts Along USA CTB	Antelope		6/1/2018		0	8702.27
Hunts Along USA CTB	Antelope		6/2/2018		0	8864.40
Hunts Along USA CTB	Antelope		6/3/2018		0	5868.86
Hunts Along USA CTB	Antelope		6/4/2018		0	5485.74
Hunts Along USA CTB	Antelope		6/5/2018		0	5274.59
Hunts Along USA CTB	Antelope		6/6/2018		0	5419.94
Hunts Along USA CTB	Antelope		6/7/2018		0	7191.69
Hunts Along USA CTB	Antelope		6/8/2018		0	8788.62
Hunts Along USA CTB	Antelope		6/9/2018		0	9342.04
Hunts Along USA CTB	Antelope		6/10/2018		0	8264.17
Hunts Along USA CTB	Antelope		6/11/2018		0	6638.05
Hunts Along USA CTB	Antelope		6/12/2018		0	5020.03
Hunts Along USA CTB	Antelope		6/13/2018		0	4428.58
Hunts Along USA CTB	Antelope		6/14/2018		0	6431.83
Hunts Along USA CTB	Antelope		6/15/2018		0	7913.93
Hunts Along USA CTB	Antelope		6/16/2018		0	9210.29
Hunts Along USA CIB	Antelope		6/17/2018		0	10310.95
Hunts Along USA CIB	Antelope		6/18/2018		0	7177.00
Hunts Along USA CTB	Antelope		6/19/2018		0	9545.47
Hunts Along USA CTB	Antelope		6/20/2018		0	8709.27
Hunts Along USA CTB	Antelope		6/21/2018		0	9246.99
Hunts Along USA CTB	Antelope		6/22/2018		0	8858.00
Hunts Along USA CTB	Antelope		6/23/2018		0	8694.51
Hunts Along USA CTB	Antelope		6/24/2018		0	8734.81
Hunts Along USA CTB	Antelope		6/25/2018		0	8145.49
Hunts Along USA CTB	Antelope		6/26/2018		0	8190.63
Hunts Along USA CTB	Antelope		6/27/2018		0	8015.16
Hunts Along USA CTB	Antelope		6/28/2018		0	7660.08
Hunts Along USA CTB	Antelope		6/29/2018		0	7836.45
-	Average 5/31/2018 thro	ugh 6/29/2018				7475.09

Hunts Along USA 12-1H, Mamie USA 21-1TFH, Mark USA 11-1H, and Timothy USA 11-1TFH-28, Shoots USA 41-2H, Demaray USA 41-2TFH NSPS OOOOa Applicability Determination for Storage tanks

Hunts Along USA Pad Facility Name

7475.09 Average of first thirty days of production

5/31/2018 Date of first production

14 Number of oil tanks

Date of LACT unit installation

0.5 Decline factor

60.55 Storage tank emissions - total

2871-2883, 2887 Tank numbers

2874, 2875, 2878, 2880, 2882 LACT permissive tanks

Completion Name	Field	Date	Down Time Hours(1)	Actual Oil Production
Kempf Trust 21-14H	Bailey	11/6/2017	0	573.42
Kempf Trust 21-14H	Bailey	11/7/2017	0	788.66
Kempf Trust 21-14H	Bailey	11/8/2017	0	759.78
Kempf Trust 21-14H	Bailey	11/9/2017	0	707.71
Kempf Trust 21-14H	Bailey	11/10/2017	0	692.57
Kempf Trust 21-14H	Bailey	11/11/2017	0	632.97
Kempf Trust 21-14H	Bailey	11/1 2/20 17	0	654.72
Kempf Trust 21-14H	Bailey	11/ 13/20 17	0	595.41
Kempí Trust 21-14H	Bailey	11/14/2017	0	617.24
Kempf Trust 21-14H	Bailey	11/15/2017	0	580.39
Kempf Trust 21-14H	Bailey	11/16/2017	0	567.81
Kempf Trust 21-14H	Bailey	11/17/2017	0	570.63
Kempf Trust 21-14H	Bailey	11/18/2017	0	539.23
Kempf Trust 21-14H	Bailey	11/19/2017	0	555.01
Kempf Trust 21-14H	Bailey	11/20/2017	0	560.53
Kempf Trust 21-14H	Bailey	11/21/2017	0	569.51
Kempf Trust 21-14H	Bailey	11/22/2017	0	554.41
Kempf Trust 21-14H	Bailey	11/23/2017	0	609.57
Kempf Trust 21-14H	Bailey	11/24/2017	0	620.35
Kempf Trust 21-14H	Bailey	11/25/2017	0	597.93
Kempf Trust 21-14H	Bailey	11/26/2017	0	\$9 5.06
Kempf Trust 21-14H	Bailey	11/27/2017	0	573.34
Kempf Trust 21-14H	Bailey	11/28/2017	0	567.27
Kempf Trust 21-14H	Bailey	11/29/2017	0	559.38
Kempf Trust 21-14H	Bailey	11/30/2017	0	536.39
Kempf Trust 21-14H	Bailey	12/1/2017	0	542.31
Kempf Trust 21-14H	Bailey	12/2/2017	o	536.47
Kempf Trust 21-14H	Bailey	12/3/2017	0	514.87
Kempf Trust 21-14H	Bailey	12/4/2017	0	508.53
Kempf Trust 21-14H	Bailey	12/5/2017	0	500.71
	Average -10/31	/2017 through 11/29/2017		592.74

Kempf Trust 21-14H

NSPS OOOOa Applicability Determination for Storage tanks

Kempf Trust 21-14H Well name

592.74 Average of first thirty days of production after re-frack, bbl/d

10/31/2017 Date of first production after re-frack

3 Number of oil tanks

9/27/2017 Date of LACT unit installation

1 Decline factor

11.19 Storage tank emissions - total

41658-41660 Tank numbers

Completion Name	Field	Date	Down Time Hours(1)	Actual Oil Production
Veronica USA CTB	Antelope	1/25/20	018	9944.45
Veronica USA CTB	Antelope	1/26/20	018	9454.80
Veronica USA CTB	Antelope	1/27/20	018	9112.89
Veronica USA CTB	Antelope	1/28/20	018 0	9183.73
Veronica USA CTB	Antelope	1/29/20	018	9540.03
Veronica USA CTB	Antelope	1/30/20	018	9476.08
Veronica USA CTB	Antelope	1/31/20	018	9958.40
Veronica USA CTB	Antelope	2/1/20	018	8248.78
Veronica USA CTB	Antelope	2/2/20	018	4613.06
Veronica USA CTB	Antelope	2/3/20	018	4520.94
Veronica USA CTB	Antelope	2/4/20	018	3556.49
Veronica USA CTB	Antelope	2/5/20	018	3606.44
Veronica USA CTB	Antelope	2/6/20	018	4333.97
Veronica USA CTB	Antelope	2/7/20	018	5076.18
Veronica USA CTB	Antelope	2/8/20	018 0	4843.84
Veronica USA CTB	Antelope	2/9/20	0 0	4697.06
Veronica USA CTB	Antelope	2/10/20	018	4587.03
Veronica USA CTB	Antelope	2/11/20	0 0	4420.82
Veronica USA CTB	Antelope	2/12/20)18 0	4527.99
Veronica USA CTB	Antelope	2/13/20	018	4777.86
Veronica USA CTB	Antelope	2/14/20	018	5477.97
Veronica USA CTB	Antelope	2/15/20	0 0	6518.27
Veronica USA CTB	Antelope	2/16/20	018	6687.84
Veronica USA CTB	Antelope	2/17/20	018	6525.28
Veronica USA CTB	Antelope	2/18/20	018	5369.58
Veronica USA CTB	Antelope	2/19/20	018	5560.02
Veronica USA CTB	Antelope	2/20/20	018	5955.73
Veronica USA CTB	Antelope	2/21/20	018	5667.58
Veronica USA CTB	Antelope	2/22/20	018	4265.76
Veronica USA CTB	Antelope	2/23/20	018	4606.03
	Average 12/15/2	017 through 1/13/7/2018		6170.50

Blue Creek USA 24-22TFH-28, Deane USA 24-22H, Rough Coulee USA 24-22TFH, TAT USA 14-22H, Veronica USA 14-22TF, Lena USA 14-22H NSPS OOOOa Applicability Determination for Storage tanks

Veronica USA Pad Facility Name

6170.50 Average of first thirty days of production

1/25/2018 Date of first production

21 Number of oil tanks

Date of LACT unit installation

0.5 Decline factor

49.98 Storage tank emissions - total

2821-2841 Tank numbers

2824, 2425,2834, 2840, 2841

Completion Name	Field	Date		Down Time Hours(1)	Actual Oil Production
Sherman USA CTB	Antelope		4/24/2018	0	5571.09
Sherman USA CTB	Antelope		4/25/2018	0	5362.58
Sherman USA CTB	Antelope		4/26/2018	0	7728.89
Sherman USA CTB	Antelope		4/27/2018	0	9876.11
Sherman USA CTB	Antelope		4/28/2018	0	11161.88
Sherman USA CTB	Antelope		4/29/2018	0	11019.61
Sherman USA CTB	Antelope		4/30/2018	0	11490.46
Sherman USA CTB	Antelope		5/1/2018	0	10207.29
Sherman USA CTB	Antelope		5/2/2018	0	10520.86
Sherman USA CTB	Antelope		5/3/2018	0	10507.29
Sherman USA CTB	Antelope		5/4/2018	0	10738.72
Sherman USA CTB	Antelope		5/5/2018	0	10042.06
Sherman USA CTB	Antelope		5/6/2018	0	9909.17
Sherman USA CTB	Antelope		5/7/2018	0	10764.07
Sherman USA CTB	Antelope		5/8/2018	0	10897.38
Sherman USA CTB	Antelope		5/9/2018	0	10342.89
Sherman USA CTB	Antelope		5/10/2018	0	10036.36
Sherman USA CTB	Antelope		5/11/2018	0	9455.08
Sherman USA CTB	Antelope		5/12/2018	0	9706:27
Sherman USA CTB	Antelope		5/13/2018	0	9777.00
Sherman USA CTB	Antelope		5/14/2018	0	10006.27
Sherman USA CTB	Antelope		5/15/2018	0	9898.41
Sherman USA CTB.	Antelope		5/16/2018	0	9009.41
Sherman USA CTB	Antelope		5/17/2018	0	9728.87
Sherman USA CTB	Antelope		5/18/2018	0	9658.28
Sherman USA CTB	Antelope		5/19/2018	0	9416.53
Sherman USA CTB	Antelope		5/20/2018	0	8821.56
Sherman USA CTB	Antelope		5/21/2018	0	7920.40
Sherman USA CTB	Antelope		5/22/2018	0	6688.38
Sherman USA CTB	Antelope		5/23/2018	0	8104.85
	Average 4/24/2	018 through 5/23/2018			9478.93

Winona USA 21-2TFH-2B, Chauncey USA 31-2H, Wilbur USA 31-2TFH, June USA 31-2H, Miles USA 41-2TFH-2B NSPS OOOOa Applicability Determination for Storage tanks

Hunts Along USA Pad Facility Name

9478.93 Average of first thirty days of production 4/24/2018 Date of first production

9 Number of oil tanks

Date of LACT unit installation

0.5 Decline factor

76.79 Storage tank emissions - total

2856-2864 Tank numbers

2860, 2862, 2864 LACT permissive tank

Completion Name	Field	Date		Down Time Hours(1)	Actual Oil Production
Stark CTB	Reunion Bay		10/27/2017	()	6739.65
Stark CTB	Reunion Bay		10/28/2017	()	6542.82
Stark CTB	Reunion Bay		10/29/2017	()	6360.04
Stark CTB	Reunion Bay		10/30/2017	()	5979.75
Stark CTB	Reunion Bay		10/31/2017	()	5823.56
Stark CTB	Reunion Bay		11/1/2017	()	5848.13
Stark CTB	Reunion Bay		11/2/2017	()	5735.86
Stark CTB	Reunion Bay		11/3/2017	C)	5605.41
Stark CTB	Reunion Bay		11/4/2017	()	5456.91
Stark CTB	Reunion Bay		11/5/2017	()	5303.25
Stark CTB	Reunion Bay		11/6/2017	()	5176.33
Stark CTB	Reunion Bay		11/7/2017	()	5181.08
Stark CTB	Reunion Bay		11/8/2017	()	4795.99
Stark CTB	Reunion Bay		11/9/2017	()	4926.49
Stark CTB	Reunion Bay		11/10/2017	()	4194.50
Stark CTB	Reunion Bay		11/11/2017	()	4130.83
Stark CTB	Reunion Bay		11/12/2017	()	4008.00
Stark CTB	Reunion Bay		11/13/2017	()	3876.51
Stark CTB	Reunion Bay		11/14/2017	()	3568.29
Stark CTB	Reunion Bay		11/15/2017	()	136.92
Stark CTB	Reunion Bay		11/16/2017	()	92.92
Stark CTB	Reunion Bay		11/17/2017	()	0.00
Stark CTB	Reunion Bay		11/18/2017	()	0.00
Stark CTB	Reunion Bay		11/19/2017	()	0.00
Stark CTB	Reunion Bay		11/20/2017	()	95.00
Stark CTB	Reunion Bay		11/21/2017	()	1346.92
Stark CTB	Reunion Bay		11/22/2017	()	3293.60
Stark CTB	Reunion Bay		11/23/2017	()	2806.21
Stark CTB	Reunion Bay		11/24/2017	()	2930.30
Stark CTB	Reunion Bay		11/25/2017	()	981.98
	Average -10/2/2017	through 10/30/2017				3697.91

NSPS OOOOa Applicability Determination for Storage tanks

Stark CTB

Facility Name

3697.91 Average of first thirty days of production after re-frack, bbl/d

10/27/2017 Date of first production after re-frack

14 Number of oil tanks

10/27/2017 Date of LACT unit installation

0.5 Decline factor

34.89 Storage tank emissions - total

2842-2855 Tank numbers

2849, 2854 LACT permissive tank

Completion Name	Field	Date		Down Time Hours(1)	Actual Oil Production
Stohler 41 CTB	Bailey		6/10/2018	0	4673.13
Stohler 41 CTB	Bailey		6/11/2018	0	4559.27
Stohler 41 CTB	Bailey		6/12/2018	0	4517.16
Stohler 41 CTB	Bailey		6/13/2018	0	4450.30
Stohler 41 CTB	Bailey		6/14/2018	0	3605.16
Stohler 41 CTB	Bailey		6/15/2018	0	1813.92
Stohler 41 CTB	Bailey		6/16/2018	0	1369.48
Stohler 41 CTB	Bailey		6/17/2018	0	1363.52
Stohler 41 CTB	Bailey		6/18/2018	0	1406.12
Stohler 41 CTB	Bailey		6/19/2018	0	1246.44
Stohler 41 CTB	Bailey		6/20/2018	0	409.45
Stohler 41 CTB	Bailey		6/21/2018	0	9.38
Stohler 41 CTB	8ailey		6/22/2018	0	617.25
Stohler 41 CTB	Bailey		6/23/2018	0	248.78
Stohler 41 CTB	Bailey		6/24/2018	0	35.19
Stohler 41 CTB	Bailey		6/25/2018	0	1117.59
Stohler 41 CTB	Bailey		6/26/2018	0	1259.84
Stohler 41 CTB	Bailey		6/27/2018	0	1371.83
Stohler 41 CTB	Bailey		6/28/2018	0	1164.07
Stohler 41 CTB	Bailey		6/29/2018	0	1.00
Stohler 41 CTB	Bailey		6/30/2018	0	297.35
Stohler 41 CTB	Bailey		7/1/2018	0	1999.11
Stohler 41 CTB	Bailey		7/2/2018	0	1675.04
Stohler 41 CTB	Bailey		7/3/2018	0	1818.37
Stohler 41 CTB	Bailey		7/4/2018	0	2213.93
Stohler 41 CTB	Bailey		7/5/2018	0	3274.92
Stohler 41 CTB	Bailey		7/6/2018	0	4241.81
Stohler 41 CTB	Bailey		7/7/2018	0	4557.92
Stohler 41 CTB	Bailey		7/8/2018	0	4979.08
Stohler 41 CTB	Bailey		7/9/2018	0	4567.04
	•	018 through 7/9/2018	, . ,		4418.75
		<u> </u>			

 $Stohler\ 21-3H,\ Stohler\ 41-3H,\ Hillesland\ 31-3TFH,\ Rita\ 41-3TFH,\ and\ Stanton\ 41-3H\\ NSPS\ OOOOa\ Applicability\ Determination\ for\ Storage\ tanks$

Stohler 41 CTB Facility Name

4418.75 Average of first thirty days of production

6/10/2018 Date of first production

6 Number of oil tanks

Date of LACT unit installation

0.6 Decline factor

50.03 Storage tank emissions - total

44046-44051 Tank numbers

Completion Name	Field	Date	Down Time Hours(1)	· Actual Oil Production
Tescher 11-27H	Bailey	10/2/2017	0	1054.13
Tescher 11-27H	Bailey	10/3/2017	0	1066.74
Tescher 11-27H	Bailey	10/4/2017	0	1031.04
Tescher 11-27H	Bailey	10/5/2017	0	1039.66
Tescher 11-27H	Bailey	10/6/2017	0	1022.99
Tescher 11-27H	Bailey	10/7/2017	0	1014.55
Tescher 11-27H	Bailey	10/8/2017	0	980.09
Tescher 11-27H	Bailey	10/9/2017	0	964.79
Tescher 11-27H	Bailey	10/10/2017	0	959.47
Tescher 11-27H	Bailey	10/11/2017	0	862.50
Tescher 11-27H	Bailey	10/12/2017	0	984.25
Tescher 11-27H	Bailey	10/13/2017	0	1018.64
Tescher 11-27H	Bailey	10/14/2017	0	981.53
Tescher 11-27H	Bailey	10/15/2017	0	1001.35
Tescher 11-27H	Bailey	10/16/2017	0	1009.31
Tescher 11-27H	Bailey	10/17/2017	0	962.31
Tescher 11-27H	Bailey	10/18/2017	0	953.40
Tescher 11-27H	Bailey	10/19/2017	0	930.40
Tescher 11-27H	Bailey	10/20/2017	0	909.73
Tescher 11-27H	Bailey	10/21/2017	0	905.18
Tescher 11-27H	Bailey	10/22/2017	0	879.61
Tescher 11-27H	Bailey	10/23/2017	0	862.03
Tescher 11-27H	Bailey	10/24/2017	0	845.35
Tescher 11-27H	Bailey	10/25/2017	0	831.96
Tescher 11-27H	Bailey	10/26/2017	0	823.66
Tescher 11-27H	Bailey	10/27/2017	0	808.49
Tescher 11-27H	Bailey	10/28/2017	0	792.15
Tescher 11-27H	Bailey	10/29/2017	0	777.14
Tescher 11-27H	Bailey	10/30/2017	0	780.83
Tescher 11-27H	Bailey	10/31/2017	0	761.44
	Average -10/2/2017 th	rough 10/31/2017		927.16

Tescher 11-27H

NSPS OOOOa Applicability Determination for Storage tanks

Tescher 11-27H

Well name

927.1581097 Average of first thirty days of production after re-frack, bbl/d

8/29/2017 Date of first production after re-frack

3 Number of oil tanks

Date of LACT unit installation

1 Decline factor

17.50 Storage tank emissions - total

41915-41917 Tank numbers

Completion Name	Field	Date	Actual Oil Production
Voight 11-15H	Murphy Creek	10/30/2017	337.53
Voight 11-15H	Murphy Creek	10/31/2017	573.42
Voight 11-15H	Murphy Creek	11/1/2017	788.66
Voight 11-15H	Murphy Creek	11/2/2017	759.78
Voight 11-15H	Murphy Creek	11/3/2017	707.71
Voight 11-15H	Murphy Creek	11/4/2017	692.57
Voight 11-15H	Murphy Creek	11/5/2017	632.97
Voight 11-15H	Murphy Creek	11/6/2017	654.72
Voight 11-15H	Murphy Creek	11/7/2017	595.41
Voight 11-15H	Murphy Creek	11/8/2017	617.24
Voight 11-15H	Murphy Creek	11/9/2017	580.39
Voight 11-15H	Murphy Creek	11/10/2017	567.81
Voight 11-15H	Murphy Creek	11/11/2017	570.63
Voight 11-15H	Murphy Creek	11/12/2017	539.23
Voight 11-15H	Murphy Creek	11/13/2017	555.01
Voight 11-15H	Murphy Creek	11/14/2017	560.53
Voight 11-15H	Murphy Creek	11/15/2017	569.51
Voight 11-15H	Murphy Creek	11/16/2017	554.41
Voight 11-15H	Murphy Creek	11/17/2017	609.57
Voight 11-15H	Murphy Creek	11/18/2017	620.35
Voight 11-15H	Murphy Creek	11/19/2017	597.93
Voight 11-15H	Murphy Creek	11/20/2017	595.06
Voight 11-15H	Murphy Creek	11/21/2017	573.34
Voight 11-15H	Murphy Creek	11/22/2017	567.27
Voight 11-15H	Murphy Creek	11/23/2017	559.38
Voight 11-15H	Murphy Creek	11/24/2017	536.39
Voight 11-15H	Murphy Creek	11/25/2017	542.31
Voight 11-15H	Murphy Creek	11/26/2017	536.47
Voight 11-15H	Murphy Creek	11/27/2017	514.87
Voight 11-15H	Murphy Creek	11/28/2017	508.53
-	Average -10/30/2017 thr		587.30

Voight 11-15H

NSPS OOOOa Applicability Determination for Storage tanks

Voight 11-15H Well name

587.30 Average of first thirty days of production after re-frack, bbl/d

10/30/2017 Date of first production after re-frack

3 Number of oil tanks

Date of LACT unit installation

1 Decline factor

11.08 Storage tank emissions - total

41288-41290 Tank numbers

Completion Name	Field	Date	Down Time Hours(1)	Actual Oil Production
KUKLA 34-34H	Murphy Creek	9/23/2017	10	427.01
KUKLA 34-34H	Murphy Creek	9/24/2017	0	468.11
KUKLA 34-34H	Murphy Creek	9/25/2017	0	457.48
KUKLA 34-34H	Murphy Creek	9/26/2017	0	482.70
KUKLA 34-34H	Murphy Creek	9/27/2017	0	475.53
KUKLA 34-34H	Murphy Creek	9/28/2017	0	325.51
KUKLA 34-34H	Murphy Creek	9/29/2017	0	73.79
KUKLA 34-34H	Murphy Creek	9/30/2017	0	47.20
KUKLA 34-34H	Murphy Creek	10/1/2017	0	110.64
KUKLA 34-34H	Murphy Creek	10/2/2017	0	601.56
KUKLA 34-34H	Murphy Creek	10/3/2017	0	457.51
KUKLA 34-34H	Murphy Creek	10/4/2017	0	650.40
KUKLA 34-34H	Murphy Creek	10/5/2017	0	596.03
KUKLA 34-34H	Murphy Creek	10/6/2017	0	534.02
KUKLA 34-34H	Murphy Creek	10/7/2017	0	518.62
KUKLA 34-34H	Murphy Creek	10/8/2017	0	489.99
KUKLA 34-34H	Murphy Creek	10/9/2017	0	478.78
KUKLA 34-34H	Murphy Creek	10/10/2017	10	472.53
KUKLA 34-34H	Murphy Creek	10/11/2017	24	449.09
KUKLA 34-34H	Murphy Creek	10/12/2017	23	441.75
KUKLA 34-34H	Murphy Creek	10/13/2017	23	430.35
KUKLA 34-34H	Murphy Creek	10/14/2017	23	416.86
KUKLA 34-34H	Murphy Creek	10/15/2017	24	407.41
KUKLA 34-34H	Murphy Creek	10/16/2017	24	399.66
KUKLA 34-34H	Murphy Creek	10/17/2017	15	394.22
KUKLA 34-34H	Murphy Creek	10/18/2017	0	381.09
KUKLA 34-34H	Murphy Creek	10/19/2017	24	371.55
KUKLA 34-34H	Murphy Creek	10/20/2017	19	363.22
KUKLA 34-34H	Murphy Creek	10/21/2017	24	360.83
KUKLA 34-34H	Murphy Creek	10/22/2017	12.00	170.54
	Average -9/23/2017	through 10/22/2017		408.47

KUKLA 34-34H

NSPS OOOOa Applicability Determination for Storage tanks

KUKLA 34-34H

Wall name

408.4656931 Average of first thirty days of production after re-frack, bbl/d

8/29/2017 Date of first production after re-frack

3 Number of oil tanks

Date of LACT unit installation

1 Decline factor

7.71 Storage tank emissions - total

43061-43066 Tank numbers

Completion Name	Field	Date		Down Time Hour	r5	Actual Oil Production
Tat USA 34 Pad	Anteloge		1/7/2018		0	7294.30
Tat USA 34 Pad	Antelope		1/8/2018		0	7609.21
Tat USA 34 Pad	Antelope		1/9/2018		0	8126.15
Tat USA 34 Pad	Antelope		1/10/2018	1	0	2545.17
Tat USA 34 Pad	Antelope		1/11/2018	1	0	5513.17
Tat USA 34 Pad	Antelope		1/12/2018		0	5476.94
Tat USA 34 Pad	Antelope		1/13/2018		0	4931.47
Tat USA 34 Pad	Antelope		1/14/2018		0	5253.53
Tat USA 34 Pad	Antelope		1/15/2018		0	6416.67
Tat USA 34 Pad	Antelope		1/16/2018	1	0	8174.47
Tat USA 34 Pad	Antelope		1/17/2018	1	0	8763.01
Tat, USA 34 Pad	Antelope		1/18/2018		0	8968.40
Tat USA 34 Pad	Antelope		1/19/2018		0	10108.93
Tat USA 34 Pad	Antelope		1/20/2018	1	0	9813.21
Tat USA 34 Pad	Antelope		1/21/2018		0	9517.30
Tat USA 34 Pad	Antelope		1/22/2018		0	8865.20
Tat USA 34 Pad	Antelope		1/23/2018		0	8974.32
Tat USA 34 Pad	Antelope		1/24/2018	1	0	9093.51
Tat USA 34 Pad	Antelope		1/25/2018	1	0	7749.78
Tat USA 34 Pad	Antelope		1/26/2018		0	6678.20
Tat USA 34 Pad	Antelope		1/27/2018	1	0	6246.89
Tat USA 34 Pad	Antelope		1/28/2018	1	0	6489.15
Tat USA 34 Pad	Antelope		1/29/2018	1	0	6430.02
Tat USA 34 Pad	Antelope		1/30/2018	1	0	4966.54
Tat USA 34 Pad	Antelope		1/31/2018	1	0	3788.29
Tat USA 34 Pad	Antelope		2/1/2018	1	0	3666.55
Tat USA 34 Pad	Antelope		2/2/2018		0	3976.75
Tat USA 34 Pad	Antelope		2/3/2018	1	0	3474.36
Tat USA 34 Pad	Antelope		2/4/2018	1	0	3576.47
Tat USA 34 Pad	Antelope		2/5/2018	1	0	3164.43
	Average 1/9/2018	through 2/7/2018				6521.75

LOCKWOOD USA 44-22TFH, TAT USA 34-22H, FORSMAN USA 44-22H, MURPHY USA 34-22TFH-2B, BEGOLA USA 34-22H NSPS OOOOa Applicability Determination for Storage tanks

Tat USA 34 Pad

Facility Name

6521.75 Average of first thirty days of production after re-frack, bbl/d

1/7/2018 Date of first production after re-frack

14 Number of oil tanks

Date of LACT unit installation

0.5 Decline factor

52.83 Storage tank emissions - total

2807-2820 Tank numbers

2814, 2820 LACT permissive tank

Completion Name	Field	Date	Down Time Hours	Actual Oil Production
Moline Pad	Big Bend, Van Hook	8/9/2017	0.00	3417.04235
Moline Pad	Big Bend, Van Hook	8/10/2017	0.00	3745.325723
Moline Pad	Big Bend, Van Hook	8/11/2017	0.00	3392.965457
Moline Pad	Big Bend, Van Hook	8/12/2017	0.00	3249.993868
Moline Pad	Big Bend, Van Hook	8/13/2017	0.00	3103.622113
Moline Pad	Big Bend, Van Hook	8/14/2017	0.00	3210.933931
Moline Pad	Big Bend, Van Hook	8/15/2017	0.00	2773.179883
Moline Pad	Big Bend, Van Hook	8/16/2017	0.00	2919.943819
Moline Pad	Big Bend, Van Hook	8/17/2017	0.00	2878.957975
Moline Pad	Big Bend, Van Hook	8/18/2017	0.00	2845.613784
Moline Pad	Big Bend, Van Hook	8/19/2017	0.00	3082.71441
Moline Pad	Big Bend, Van Hook	8/20/2017	0.00	2652.797448
Moline Pad	Big Bend, Van Hook	8/21/2017	0.00	2820.267173
Moline Pad	Big Bend, Van Hook	8/22/2017	0.00	2381.442351
Moline Pad	Big Bend, Van Hook	8/23/2017	0.00	2395.885721
Moline Pad	Big Bend, Van Hook	8/24/2017	0.00	2566.079267
Moline Pad	Big Bend, Van Hook	8/25/2017	0.00	2176.561645
Moline Pad	Big Bend, Van Hook	8/26/2017	0.00	1081.683535
Moline Pad	Big Bend, Van Hook	8/27/2017	0.00	1259.256965
Moline Pad	Big Bend, Van Hook	8/28/2017	0.00	1152.717258
Moline Pad	Big Bend, Van Hook	8/29/2017	0.00	661.5746259
Moline Pad	Big Bend, Van Hook	8/30/2017	0.00	166.6666667
Moline Pad	Big Bend, Van Hook	8/31/2017	0.00	1000.732391
Moline Pad	Big Bend, Van Hook	9/1/2017	0.00	1176.540038
Moline Pad	Big Bend, Van Hook	9/2/2017	0.00	1235.712234
Moline Pad	Big Bend, Van Hook	9/3/2017	0.00	1367.017352
Moline Pad	Big Bend, Van Hook	9/4/2017	0.00	2051.201123
Moline Pad	Big Bend, Van Hook	9/5/2017	0.00	2725.296445
Moline Pad	Big Bend, Van Hook	9/6/2017	0.00	2809.133172
Moline Pad	Big Bend, Van Hook	9/7/2017	0.00	2772.026905
	Average - 8/9/2017 thre	ough 9/7/2017		2302.429521

MOLINE 14-32H, LACEY USA 11-5H

NSPS OOOOa Applicability Determination for Storage tanks

Moline Pad Facility name

2302.429521 Average of first thirty days of production

8/9/2017 Date of first production

10 Number of oil tanks

7/25/2017 Date of LACT unit installation

0.5 Decline factor

20.67 Storage tank emissions - total

2796-2805 Tank numbers

2799, 2800, 2804, 2805 LACT permissive tank

Appendix F- Storage Tank Requirements Deviations

Facility	Inspection Date	Issue	Repair	Repair Date
Clarks Creek USA CTB	12/17/2017	leak on Water Tank #1	Water Tank #1 Thief Hatch Cleaned	12/17/2017
Golberg USA CTB	3/9/2018	leak on Water Tank #3	Water Tank #3 leak fixed	3/9/2018
Raymond USA CTB	5/16/2018	Hatches leaking.	Gasket cleaned.	5/16/2018
Mikkelsen USA		Hatches leaking.	Flame Arrestor replaced	5/29/2018
Eagle USA 41- 15H	8/1/2018	Tank 2313 thief hatch leaking	Tank 2313 thief hatch stuck. Hatch was reset and cleaned	8/1/2018
Marlin 14 CTB	2/21/2018	Thief Hatch Leak	leak fixed	4/11/2018
Voight 11-15H	3/26/2818	Leak on load out of tank # 41289	leak fixed	5/31/2018
Mary Hansen 14- 9H	4/22/2018	Production Line to back of tank leaking	leak fixed	5/29/2018
Mary Hansen 14- 9H	4/22/2018	Vent line leaking at threads	leak fixed	5/29/2018
Mary Hansen 14- 9H	5/14/2018	Vent Line Leak at tank	leak fixed	5/29/2018
Mary Hansen 14- 9H	5/14/2018	Production line leaking at tank drain	leak fixed	5/29/2018
William Kukla CTB 7/13/202		Leaking thief hatch on tank #43066	Thief Hatch Internals replaced, Flame arrestor replaced.	8/24/2018

Appendix G – Fugitive Emissions Components Monitoring Surveys

No	Identification of Each Affected Facility		Time	Survey End Time	Ambient Temperature During Survey	Sky Conditions During Survey	Maximum Wind Speed During Survey	Instrument Used	2nd Monitoring Instrument Used	Name of Surveyor	Deviations From Monitoring Plan if none State none	Number of Each Component for Which Fugitive Emissions Detected	Date of Successful Repair of Fugitive Emissions Component	Type of Instrument Used to Resurvey Components Not Repaired During Original Survey
2017083046990 .0	Oscar Stohler Pad	8/30/2017	12:30:00	13:04:00	79	Sunny	15	FLIR / BK 2 - 4440657		(b) (6)	No	0		
2017090136207	Trotter Pad	9/1/2017	09:03:00	10:05:00	71	Overcast	8	FLIR / BK 2 - 4440657			No	0		
2017090841713	Beck Pad	9/8/2017	10:35:00	11:36:00	64	Sunny	5	FLIR / BK 2 - 4440657			No	0		
201709111.0	Moline-Lacey Pad	9/6/2017	11:30:00	12:30:00	65	Sunny	11.5	FLIR / BK 1 - 44402088			No	0		
2017100210.0	William Kukla Pad	10/2/2017	13:00:00	13:30:00	52	Partly Cloudy	7	FLIR / BK 2 - 4440657			No	0		
201710033.0	Delia USA pad	10/2/2017	11:33:00	12:35:00	51	Partly Cloudy	9	FLIR / BK 2 - 4440657			No	0		
2017100922.0	Charchenko 14 Pad	10/9/2017	15:18:00	15:18:00	51	Sunny	15	FLIR / BK 2 - 4440657			No	0		
201711066.0	Appledoom 14 Pad	11/6/2017	12:45:00	12:59:00	20	Overcast	7	FLIR / BK 1 - 4402088			No	0		
201711068.0	Christensen Pad	11/6/2017	13:10:00	13:24:00	22	Overcast	7	FLIR / BK 1 - 4402088			No	0		
201711075.0	Tescher 11-27H	11/7/2017	11:30:00	12:06:00	23	Sunny	10	FLIR / BK 2 - 4440657			No	0		
2017110833.0	Goldberg USA Pad	10/31/2017	10:00:00	10:45:00	28	Sunny	9.2	FLIR / BK 1 - 4402088			No	0		
2017110834.0	Raymond USA Pad	10/31/2017	10:30:00	10:46:00	28	Sunny	9.2	FLIR / BK 1 - 4402088			No	0		
2017120114.0	Trotter Pad	12/1/2017	12:40:00	12:51:00	46	Partly Cloudy	15	FLIR / BK 2 - 4440657			No	0		
201801141,0	Stark Pad	11/2/2017	09:00:00	10:00:00	26	Overcast	16	FLIR / BK 1 - 4402088			No	0		
201801142.0	Mikkelsen 11- 14H	11/2/2017	10:02:00	16:03:00	26	Overcast	16	FLIR / BK 1 - 4402088			No	0		
201801145.0	Grady USA	11/2/2017	16:39:00	16:40:00	28	Overcast	16	FLIR / BK 1 - 4402088			No	0		
2018011910.0	Chapman	1/19/2018	13:07:00	15:12:00	41	Overcast	11	FLIR / BK 2 - 4440657			No	0		
2018020712.0	Pelton Pad	2/7/2018	09:20:00	09:50:00	-3	Overcast	7	FLIR / BK 2 - 4440657			No	0		
2018020716.0	Felix USA Pad	2/7/2018	11:10:00	11:30:00	1	Overcast	7	FLIR / BK 2 - 4440657			No	0		
2018020717.0	Ringer Pad	2/7/2018	12:00:00	12:20:00	5	Overcast	7	FLIR / BK 2 - 4440657			No	0		
2018020724.0	O'Neil 34 Pad	2/7/2018	13:00:00	13:20:00	8	Overcast	7	FLIR / BK 2 - 4440657			No	0		
2018020726.0	O'Neil 24 Pad	2/7/2018	13:20:00	14:38:00	9	Overcast	7	FLIR / BK 2 - 4440657			No	0		
2018020728.0	Veronica USA	1/25/2018	10:30:00	12:30:00	28	Overcast	9	FLIR / BK 2 - 4440657			No	0		

No	Identification of Each Affected Facility		Time	Survey End Time	Ambient Temperature During Survey	Sky Conditions During Survey	Maximum Wind Speed During Survey	Monitoring Instrument Used	2nd Monitoring Instrument Used	Name of Surveyor	Deviations From Monitoring Plan If none State none	Type of Component for which Fugitive Emissions Detected	Number of Each Component for Which Fugitive Emissions Detected	Date of Successful Repair of Fugitive Emissions Component	Type of Instrument Used to Resurvey Components Not Repaired During Original Survey
	77777		10:40:00	10:55:00	-3	Sunny	5	FLIR / BK 2 - 4440657		(b) (6)	No		0		
2018021315.0	Trotter Pad	2/13/2018	11.10:00	11:30:00	16	Sunny	18	FLIR / BK 2 - 4440657			No		0		
2018021317.0	Oscar Stohler Pad	2/13/2018	11:30:00	11:49:00	21	Sunny	18	FLIR / BK 2 - 4440657			No		0		
201802218.0	TAT USA 34 Pad	2/21/2018	10:30:00	11:00:00	4	Sunny	7	FLIR / BK 2 - 4440657			No		0		
2018030830.0	Fred Hansen Pad	3/8/2018	21:46:00	22:47:00	9	Sunny	3	FLIR / BK 2 - 4440657			No		0		
201804099.0	Kukla 34 Pad	4/9/2018	00:30:00	13:00:00	28	Overcast	9	FLIR / BK 2 - 4440657			No		0		
2018041125.0	Tescher 11-27H Pad	4/11/2018	10:30:00	23:00:00	37	Overcast	14	FLIR / BK 2 - 4440657			No		0		
2018041214.0	Martinez USA 24-8H	4/12/2018	08:00:00	09:21:00	31	Overcast	8	FLIR / BK 2 - 4440657			No		0		
201804186.1	Goldberg USA Pad	4/18/2018	10:15:00	10:55:00	37	Overcast	2	FLIR / BK 2 - 4440657			No		0		
2018052511.0	Moline-Lacey Pad	5/25/2018	10:00:00	10:20:00	80.5	Sunny	19.2	FLIR / Insight - 44401177			No		0		
2018052913.0	O'Neil 24 Pad	5/29/2018	09:00:00	09:20:00	68	Overcast	8	FLIR / BK 2 - 4440657			No		0		
2018052915.0	O'Neil 34 Pad	5/29/2018	09:25:00	09:41:00	68	Overcast	8	FLIR / BK 2 - 4440657			No		0		
2018052919.0	Stohler 41 Pad	5/29/2018	10:45:00	11:10:00	69	Overcast	3	FLIR / BK 2 - 4440657			No		0		
2018052921.0	Trotter Pad	5/29/2018	11:30:00	11:45:00	72	Overcast	3	FLIR / BK 2 - 4440657			No		0		
201805301.0	Pelton Pad	5/30/2018	07:20:00	07:39:00	63	Partly Cloudy	8	FLIR / BK 2 - 4440657			No		0		
2018053118.0	Appledoorn 14 Pad	5/31/2018	09:45:00	09:55:00	74	Partly Cloudy	7	FLIR / BK 2 - 4440657			No		0		
2018053135.0	Mary Hansen Pad	5/31/2018	14:00:00	14:09:00	65	Overcast	8	FLIR / BK 2 - 4440657			No		0		
2018053138.0	Repp Trust Pad	5/31/2018	14:30:00	14:43:00	67	Overcast	10	FLIR / BK 2 - 4440657			No		0		
2018060119.0	Kempf Trust Pad	6/1/2018	10:15:00	10:30:00	69	Partly Cloudy	13	FLIR / BK 2 - 4440657			No		0		
201806018.0	Repp Pad	6/1/2018	07:40:00	07:55:00	63	Partly Cloudy	13	FLIR / BK 2 - 4440657			No		0		
2018060414.0	LaDonna Klatt Pad	6/4/2018	11:40:00	11:54:00	80	Sunny	8	FLIR / BK 2 - 4440657			No		0		
2018060423.0	Ringer Pad	6/4/2018	13:00:00	13:22:00	84	Partly Cloudy		FLIR / BK 2 - 4440657			No		0		
2018060522.0	Beck Pad	6/5/2018	11:40:00	11:45:00	75	Partly Cloudy	7	FLIR / BK 2 - 4440657			No		0		

No	Identification of Each Affected Facility		Time	Survey End Time	Ambient Temperature During Survey	During Survey	Maximum Wind Speed During Survey	Instrument Used	2nd Monitoring Instrument Used	Name of Surveyor	Deviations From Monitoring Plan If none State none	Type of Component for which Fugitive Emissions Detected	Number of Each Component for Which Fugitive Emissions Detected	Successful Repair of Fugitive Emissions Component	Type of Instrument Used to Resurvey Components Not Repaired During Original Survey
201806124.0	Chapman	6/12/2018	08:15:00	08:40:00	59	Sunny	16	FLIR / BK 2 - 4440657		(b) (6)	No		0		
201807307.0	Oscar Stohler Pad	7/30/2018	22:50:00	11:11:00	78	Partly Cloudy	7	FLIR / BK 2 - 4440657			No		0		
201807309.0	Stohler 41 Pad	7/30/2018	11:00:00	12:08:00	80	Partly Cloudy	7	FLIR / BK 2 - 4440657			No		0		
2017083138848 .0	Charchenko 14 Pad	8/31/2017	10:35:00	10:51:00	72	Overcast	4	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	,	9/26/2017	
201709112.0	Kermit USA	9/6/2017	14:30:00	16:00:00	73	Sunny	11.5	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	1	9/11/2017	FLIR / Bakken 1 - 44402088
201709112.0	Kermit USA	9/6/2017	14:30:00	16:00:00	73	Sunny	11.5	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	1	9/11/2017	FLIR / Bakken 1 - 44402088
2017101015.0	Wm & Agnes Scott Pad	10/10/2017	09:15:00	09:33:00	40	Sunny	10	FLIR / BK 2 - 4440657			No	Open-Ended Lines	1	11/30/2017	
2017101015.0	Wm & Agnes Scott Pad	10/10/2017	09:15:00	09:33:00	40	Sunny	10	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	1	12/12/2017	FLIR / Bakken 2 - 44400657
2017101610.0	Pearl Pad	11/2/2017	11:05:00	22:30:00	41	Sunny	6.9	FLIR / BK 1 - 4402088			No	Flanges	1	1/19/2018	
201711069.0	Voigt Pad	11/6/2017	14:05:00	15:24:00	20	Overcast	10	FLIR / BK 1 - 4402088			No	Thief hatches or other openings on a controlled storage vessel	1	1/19/2018	
201711069.0	Voigt Pad	11/6/2017	14:05:00	15:24:00	20	Overcast	10	FLIR / BK 1 - 4402088			No	Thief hatches or other openings on a controlled storage vessel	1	1/19/2018	
201711074.0	Kempf Trust Pad	11/7/2017	11:00:00	11:25:00	20	Sunny	10	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	1	1/18/2018	

Facility Record No	Identification of Each Affected Facility	Date of Survey	Survey Begin Time	Survey End Time	Ambient Temperature During Survey	Sky Conditions During Survey	Maximum Wind Speed During Survey	Monitoring Instrument Used	2nd Monitoring Instrument Used	Name of Surveyor	Deviations From Monitoring Plan If none State none		Number of Each Component for Which Fugitive Emissions Detected	Date of Successful Repair of Fugitive Emissions Component	Type of Instrument Used to Resurvey Components Not Repaired During Original Survey
201711074.0	Kempf Trust Pad	11/7/2017	11:00:00	11:25:00	20	Sunny	10	FLIR / BK 2 - 4440657		(b) (6)	No	Thief hatches or other openings on a controlled storage vessel	1	1/18/2018	
2017112718.0	Chapman	11/27/2017	12:30:00	12:49:00	54	Overcast	15	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	1	1/19/2018	FLIR / Bakken 2 - 44400657
201801144.0	Bingo Pad	11/2/2017	16:19:00	16:23:00	26	Partly Cloudy	16	FLIR / BK 1 - 4402088			No	Thief hatches or other openings on a controlled storage vessel	1	1/14/2018	
201801144.0	Bingo Pad	11/2/2017	16:19:00	16:23:00	26	Partly Cloudy	16	FLIR / BK 1 - 4402088			No	Thief hatches or other openings on a controlled storage vessel	1	1/14/2018	
201801146.0	Clarks Creek USA Pad	11/2/2017	16:48:00	16:52:00	28	Overcast	16	FLIR / BK 1 - 4402088			No	Thief hatches or other openings on a controlled storage vessel	1	1/14/2018	
201801147.0	Kermit USA	11/2/2017	16:57:00	17:00:00	28	Overcast	16	FLIR / BK 1 - 4402088			No		0	1/14/2018	
2018012611.0	TAT USA 34 Pad	1/25/2018	08:30:00	22:30:00	28	Overcast	9	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	1	2/21/2018	FLIR / Bakken 2 - 44400657
2018012611.0	TAT USA 34 Pad	1/25/2018	08:30:00	22:30:00	28	Overcast	9	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	1	2/21/2018	
201802079.0	Larry Repp 31 Pad	2/7/2018	08:45:00	09:10:00	-5	Overcast	7	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	1	7/10/2018	
201802079.0	Larry Repp 31 Pad	2/7/2018	08:45:00	09:10:00	-5	Overcast	7	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	1	7/10/2018	

No	Identification of Each Affected Facility		Time	Survey End Time	Ambient Temperature During Survey	Sky Conditions During Survey	Maximum Wind Speed During Survey	Instrument Used	2nd Monitoring Instrument Used	Name of Surveyor	Deviations From Monitoring Plan If none State none	Component for which Fugitive Emissions Detected	Number of Each Component for Which Fugitive Emissions Detected	Successful Repair of Fugitive Emissions Component	Type of Instrument Used to Resurvey Components Not Repaired During Original Survey
201802079.0	Larry Repp 31 Pad	2/7/2018	08:45:00	09;10:00	-5	Overcast	7	FLIR / BK 2 - 4440657		(b) (6)	No	Thief hatches or other openings on a controlled storage vessel		2/22/2018	
2018020713.0	Evelyn	2/7/2018	10:00:00	10:32:00	-1	Overcast	7	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	1	3/7/2018	
2018020713.0	Evelyn	2/7/2018	10:00:00	10:32:00	-1	Overcast	7	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	1	3/7/2018	
2018020910.0	Mary Hansen Pad	2/9/2018	10:20:00	10:45:00	-6	Sunny	5	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	1	3/7/2018	FLIR / Bakken 2 - 44400657
2018021310.0	Repp Trust Pad	2/13/2018	10:00:00	10.32.00	13	Sunny	18	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	1	8/10/2018	FLIR / Bakken 1 - 44402088
2018021310.0	Repp Trust Pad	2/13/2018	10:00:00	10:32:00	13	Sunny	18	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	,	7/10/2018	
2018021313.0	Repp Pad	2/13/2018	10:30:00	10:55:00	16	Sunny	18	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	1	7/6/2018	
2018021313.0	Repp Pad	2/13/2018	10:30:00	10:55:00	16	Sunny	18	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	1	7/6/2018	
201802237.0	Marlin 14 Pad	2/23/2018	11:30:00	12:24:00	14	Sunny	8	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	,	4/11/2018	FLIR / Bakken 2 - 44400657
201802237.0	Marlin 14 Pad	2/23/2018	11:30:00	12:24:00	14	Sunny	8	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	1	4/11/2018	FLIR / Bakken 2 - 44400657

No	Identification of Each Affected Facility		Survey Begin Time	Survey End Time	Ambient Temperature During Survey	Sky Conditions During Survey	Maximum Wind Speed During Survey	Instrument Used	2nd Monitoring Instrument Used	Name of Surveyor		Type of Component for which Fugitive Emissions Detected		Date of Successful Repair of Fugitive Emissions Component	Type of Instrument Used to Resurvey Components Not Repaired During Original Survey
2018030113.0	Marlin 44 Pad	3/1/2018	11:48:00	12:50:00	31	Sunny	8	FLIR / BK 2 - 4440657		(b) (6)	No	Connectors	1	3/1/2018	
2018031216.0	Bethol CTB	3/8/2018	20:45:00	22:00:00	14	Sunny	3	FLIR / BK 2 - 4440657				Thief hatches or other openings on a controlled storage vessel	1	3/12/2018	
2018031217.0	Beck Pad	3/12/2018	23:30:00	14:00:00	32	Sunny	4	FLIR / BK 2 - 4440657				Thief hatches or other openings on a controlled storage vessel	1	3/12/2018	
2018031217.0	Beck Pad	3/12/2018	23:30:00	14:00:00	32	Sunny	4	FLIR / BK 2 - 4440657				Thief hatches or other openings on a controlled storage vessel	1	3/12/2018	
2018040339.0	Delia USA pad	4/3/2018	23:30:00	12:40:00	20	Overcast	9	FLIR / BK 1 - 4402088			No	Pressure Relief Devices	1	4/10/2018	FLIR / Bakken 2 - 44400657
2018040640.0	Charchenko 14 Pad	4/6/2018	12:15:00	13:00:00	14	Sunny	11	FLIR / BK 2 - 4440657				Thief hatches or other openings on a controlled storage vessel	1	4/10/2018	FLIR / Bakken : - 44400657
2018040910.0	Wm & Agnes Scott Pad	4/9/2018	13:15:00	14:15:00	28	Overcast	9	FLIR / BK 2 - 4440657				Thief hatches or other openings on a controlled storage vessel	1	7/10/2018	
2018051624.0	Goldberg USA	5/16/2018	09:02:00	12:00:00	76	Sunny	6.2	FLIR / Insight -			No		0	5/16/2018	
2018051624.0	Pad Goldberg USA	5/16/2018	09:02:00	12:00:00	76	Sunny	6.2	44401177 FLIR / Insight -			No		0	5/22/2018	
2018051624.0	Goldberg USA Pad	5/16/2018	09:02:00	12:00:00	76	Sunny	6.2	44401177 FLIR / Insight - 44401177				Thief hatches or other openings on a controlled storage vessel	1	5/16/2018	
2018051624.0	Goldberg USA Pad	5/16/2018	09:02:00	12:00:00	76	Sunny	6.2	FLIR / Insight - 44401177				Thief hatches or other openings on a controlled storage vessel	1	6/13/2018	

No	Identification of Each Affected Facility		Time	Survey End Time	Ambient Temperature During Survey	Sky Conditions During Survey	Maximum Wind Speed During Survey	Instrument Used	2nd Monitoring Instrument Used	Name of Surveyor	Deviations From Monitoring Plan If none State none	Type of Component for which Fugitive Emissions Detected	Number of Each Component for Which Fugitive Emissions Detected	Date of Successful Repair of Fugitive Emissions Component	Type of Instrument Used to Resurvey Components Not Repaired During Original Survey
2018052510.0	Raymond USA Pad	5/25/2018	08:55:00	09:50:00	77	Sunny	15.2	FLIR / Insight - 44401177		(b) (6)	No	Thief hatches or other openings on a controlled storage vessel	1	5/26/2018	
2018052510.0	Raymond USA Pad	5/25/2018	08:55:00	09:50:00	77	Sunny	15.2	FLIR / Insight - 44401177			No	Thief hatches or other openings on a controlled storage vessel	1	6/13/2018	
2018052510.0	Raymond USA Pad	5/25/2018	08:55:00	09:50:00	77	Sunny	15.2	FLIR / Insight - 44401177			No	Thief hatches or other openings on a controlled storage vessel	1	5/26/2018	
2018052510.0	Raymond USA Pad	5/25/2018	08:55:00	09:50:00	77	Sunny	15.2	FLIR / Insight - 44401177			No	Thief hatches or other openings on a controlled storage vessel	1	6/13/2018	
2018052510.0	Raymond USA Pad	5/25/2018	08:55:00	09:50:00	77	Sunny	15.2	FLIR / Insight - 44401177			No		0	5/26/2018	
2018052510.0	Raymond USA Pad	5/25/2018	08:55:00	09:50:00	77	Sunny	15.2	FLIR / Insight - 44401177			No		0	6/13/2018	
2018052512.0	Stark Pad	5/25/2018	10:35:00	11:05:00	80.9	Sunny	18.7	FLIR / Insight - 44401177			No	Thief hatches or other openings on a controlled storage vessel	1	5/26/2018	
2018052512.0	Stark Pad	5/25/2018	10:35:00	11:05:00	80.9	Sunny	18.7	FLIR / Insight - 44401177			No	Thief hatches or other openings on a controlled storage vessel	1	6/13/2018	
2018052512.0	Stark Pad	5/25/2018	10:35:00	11:05:00	80.9	Sunny	18.7	FLIR / Insight - 44401177			No	Thief hatches or other openings on a controlled storage vessel	1	5/26/2018	
2018052512.0	Stark Pad	5/25/2018	10:35:00	11:05:00	80.9	Sunny	18.7	FLIR / Insight - 44401177			No	Thief hatches or other openings on a controlled storage vessel	1	6/13/2018	
2018052513.0	Pearl Pad	5/25/2018	12:00:00	12:30:00	83	Sunny	14	FLIR / Insight - 44401177			No	Thief hatches or other openings on a controlled storage vessel	1	5/26/2018	

No	Identification of Each Affected Facility		Time	Survey End Time	Ambient Temperature During Survey	Sky Conditions During Survey	Speed During Survey	Instrument Used	2nd Monitoring Instrument Used	Name of Surveyor	Deviations From Monitoring Plan If none State none	Component for which Fugitive Emissions Detected	Which Fugitive Emissions Detected	Successful Repair of Fugitive Emissions Component	Type of Instrument Used to Resurvey Components Not Repaired During Original Survey
2018052513.0	Pearl Pad	5/25/2018	12:00:00	12:30:00	83	Sunny	14	FLIR / Insight - 44401177		(b) (6)	No	Thief hatches or other openings on a controlled storage vessel	1	6/22/2018	
2018052513.0	Pearl Pad	5/25/2018	12:00:00	12:30:00	83	Sunny	14	FLIR / Insight - 44401177			No	Thief hatches or other openings on a controlled storage vessel	1	5/26/2018	
2018052513.0	Pearl Pad	5/25/2018	12:00:00	12:30:00	83	Sunny	14	FLIR / Insight - 44401177			No	Thief hatches or other openings on a controlled storage vessel	1	6/22/2018	
2018052514.2	Clarks Creek USA Pad	5/25/2018	13:00:00	13:25:00	83.3	Sunny	11.8	FLIR / Insight - 44401177			No	Thief hatches or other openings on a controlled storage vessel	1	5/26/2018	
2018052514 2	Clarks Creek USA Pad	5/25/2018	13:00:00	13:25:00	83.3	Sunny	11.8	FLIR / Insight - 44401177			No	Thief hatches or other openings on a controlled storage vessel	1	6/22/2018	
201805259.1	Grady USA	5/25/2018	12:35:00	12:00:00	84.5	Sunny	12.7	FLIR / Insight - 44401177			No	Thief hatches or other openings on a controlled storage vessel	1	5/26/2018	
201805259.1	Grady USA	5/25/2018	12:35:00	12:00:00	84.5	Sunny	12.7	FLIR / Insight - 44401177			No	Thief hatches or other openings on a controlled storage vessel	1	6/22/2018	
201805259.1	Grady USA	5/25/2018	12:35:00	12:00:00	84.5	Sunny	12.7	FLIR / Insight - 44401177			No	Thief hatches or other openings on a controlled storage vessel	1	5/26/2018	
201805259.1	Grady USA	5/25/2018	12:35:00	12:00:00	84.5	Sunny	12.7	FLIR / Insight - 44401177			No	Thief hatches or other openings on a controlled storage vessel	1	6/22/2018	

No	Identification of Each Affected Facility		Time	Survey End Time	Ambient Temperature During Survey	Sky Conditions During Survey	Speed During Survey	Instrument Used	2nd Monitoring Instrument Used	Name of Surveyor	Deviations From Monitoring Plan If none State none	Component for which Fugitive Emissions Detected	Number of Each Component for Which Fugitive Emissions Detected	Successful Repair of Fugitive Emissions Component	Type of Instrument Used to Resurvey Components Not Repaired During Original Survey
2018052515.0	Mikkelsen 11- 14H	5/25/2018	11:15:00	11:55:00	82.4	Sunny	15.2	FLIR / Insight - 44401177		(b) (6)	No	Thief hatches or other openings on a controlled storage vessel	1	5/26/2018	
2018052515.0	Mikkelsen 11- 14H	5/25/2018	11:15:00	11:55:00	82.4	Sunny	15.2	FLIR / Insight - 44401177			No	Thief hatches or other openings on a controlled storage vessel	1	6/22/2018	
2018052515.0	Mikkelsen 11- 14H	5/25/2018	11:15:00	11:55:00	82.4	Sunny	15.2	FLIR / Insight - 44401177			No		0	5/26/2018	
2018052516.0	Kermit USA	5/25/2018	14:10:00	14:45:00	87.5	Sunny	15.2	FLIR / insight - 44401177			No	Thief hatches or other openings on a controlled storage vessel	1	5/26/2018	
2018052516.0	Kermit USA	5/25/2018	14:10:00	14:45:00	87.5	Sunny	15.2	FLIR / Insight - 44401177			No	Thief hatches or other openings on a controlled storage vessel	1	6/27/2018	
2018052516.0	Kermit USA	5/25/2018	14:10:00	14:45:00	87.5	Sunny	15.2	FLIR / Insight - 44401177			No		0	5/26/2018	
2018052516.0	Kermit USA	5/25/2018	14:10:00	14:45:00	87.5	Sunny	15.2	FLIR / Insight - 44401177			No		0	6/27/2018	
2018052517.0	Veronica USA	5/25/2018	15:00:00	15:50:00	86.6	Sunny	11.8	FLIR / Insight - 44401177			No		0	5/26/2018	
2018052517.0	Veronica USA	5/25/2018	15:00:00	15:50:00	86.6	Sunny	11.8	FLIR / Insight - 44401177			No		0	6/22/2018	
2018052517.0	Veronica USA	5/25/2018	15:00:00	15:50:00	86.6	Sunny	11.8	FLIR / Insight - 44401177			No	Thief hatches or other openings on a controlled storage vessel	1	5/26/2018	
2018052517.0	Veronica USA	5/25/2018	15:00:00	15:50:00	86.6	Sunny	11.8	FLIR / Insight - 44401177			No	Thief hatches or other openings on a controlled storage vessel	1	6/22/2018	
2018052517.0	Veronica USA	5/25/2018	15:00:00	15:50:00	86.6	Sunny	11.8	FLIR / Insight - 44401177			No	Valves	1	5/26/2018	
2018052517.0	Veronica USA	5/25/2018	15:00:00	15:50:00	86.6	Sunny	11.8	FLIR / Insight - 44401177			No	Valves	1	6/22/2018	
2018052518.0	TAT USA 34 Pad	5/25/2018	15:35:00	12:40:00	88.3	Sunny	14.3	FLIR / Insight - 44401177			No	Thief hatches or other openings on a controlled storage vessel	1	5/26/2018	

Facility Record No	Identification of Each Affected Facility	Date of Survey	Survey Begin Time	Survey End Time	Ambient Temperature During Survey	Sky Conditions During Survey	Maximum Wind Speed During Survey	Instrument Used	2nd Monitoring Instrument Used	Name of Surveyor	Deviations From Monitoring Plan If none State none	Component for which Fugitive Emissions Detected	Number of Each Component for Which Fugitive Emissions Detected	Successful Repair of Fugitive Emissions Component	Type of Instrument Used to Resurvey Components Not Repaired During Original Survey
2018052518.0	TAT USA 34 Pad	5/25/2018	15:35:00	12:40:00	88,3	Sunny	14.3	FLIR / Insight - 44401177		(b) (6)	No	Thief hatches or other openings on a controlled storage vessel		6/22/2018	
2018052518.0	TAT USA 34 Pad	5/25/2018	15:35:00	12:40:00	88.3	Sunny	14.3	FLIR / Insight - 44401177			No	Thief hatches or other openings on a controlled storage vessel	1	5/26/2018	
2018052518.0	TAT USA 34 Pad	5/25/2018	15:35:00	12:40:00	88.3	Sunny	14.3	FLIR / Insight - 44401177			No	Thief hatches or other openings on a controlled storage vessel	1	6/22/2018	
2018052519.0	Eagle USA Pad	5/25/2018	17:05:00	17:25:00	86.2	Sunny	10.9	FLIR / Insight - 44401177			No	Thief hatches or other openings on a controlled storage vessel	1	5/26/2018	
2018052519.0	Eagle USA Pad	5/25/2018	17:05:00	17:25:00	86.2	Sunny	10.9	FLIR / Insight - 44401177			No	Thief hatches or other openings on a controlled storage vessel		6/27/2018	
2018052519.0	Eagle USA Pad	5/25/2018	17:05:00	17:25:00	86.2	Sunny	10.9	FLIR / Insight - 44401177			No	Thief hatches or other openings on a controlled storage vessel		5/26/2018	
2018052519.0	Eagle USA Pad	5/25/2018	17:05:00	17:25:00	86.2	Sunny	10.9	FLIR / Insight - 44401177			No	Thief hatches or other openings on a controlled storage vessel		6/27/2018	
2018052917.0	Oscar Stohler Pad	5/29/2018	10.10:00	10:27:00	68	Overcast	8	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel		6/13/2018	
2018052917.0	Oscar Stohler Pad	5/29/2018	10:10:00	10:27:00	68	Overcast	8	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel		5/29/2018	

No	Identification of Each Affected Facility		Time	Survey End Time	Ambient Temperature During Survey	Sky Conditions During Survey	Maximum Wind Speed During Survey	Instrument Used	2nd Monitoring Instrument Used	Name of Surveyor	Deviations From Monitoring Plan If none State none	Component for which Fugitive Emissions Detected	Which Fugitive Emissions Detected	Successful Repair of Fugitive Emissions Component	Type of Instrument Used to Resurvey Components Not Repaired During Original Survey
2018053039 0	Voigt Pad	5/30/2018	11:00:00	11:24.00	70	Partly Cloudy	8	FLIR / BK 2 - 4440657		(b) (6)	No	Thief hatches or other openings on a controlled storage vessel	1	5/30/2018	
2018053039.0	Voigt Pad	5/30/2018	11:00:00	11:24:00	70	Partly Cloudy	8	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	1	6/15/2018	
2018053054 0	Bethol CTB	5/30/2018	14:20:00	14:06:00	75	Partly Cloudy	8	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	1	5/31/2018	
2018053054.0	Bethol CTB	5/30/2018	14:20:00	14:06:00	75	Partly Cloudy	8	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	1	6/15/2018	FLIR / Bakken 2 - 44400657
2018053054.0	Bethol CTB	5/30/2018	14:20:00	14:06:00	75	Partly Cloudy	8	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	1	6/5/2018	
2018053054.0	Bethol CTB	5/30/2018	14:20:00	14:06:00	75	Partly Cloudy	8	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	1	6/15/2018	FLIR / Bakken 2 - 44400657
2018053060.0	Chapman	5/30/2018	09.40.00	22.44.00	63	Partly Cloudy	8	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	1	5/30/2018	
2018053060 0	Chapman	5/30/2018	09:40:00	22:44.00	63	Partly Cloudy	8	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	1	6/13/2018	
2018053136.0	Larry Repp 31 Pad	5/31/2018	14:20:00	14:30:00	67	Overcast	10	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	1	5/31/2018	

No	Identification of Each Affected Facility		Time	Survey End Time	Ambient Temperature During Survey	Sky Conditions During Survey	Maximum Wind Speed During Survey	Instrument Used	2nd Monitoring Instrument Used	Name of Surveyor	Deviations From Monitoring Plan If none State none	Component for which Fugitive Emissions Detected	Number of Each Component for Which Fugitive Emissions Detected	Successful Repair of Fugitive Emissions Component	Type of Instrument Used to Resurvey Components Not Repaired During Original Survey
2018053136.0	Larry Repp 31 Pad	5/31/2018	14:20:00	14:30:00	67	Overcast	10	FLIR / BK 2 - 4440657		(b) (6)	No	Thief hatches or other openings on a controlled storage vessel	1	8/24/2018	FLIR / Bakken 1 - 44402088
2018053140.0	Quill Pad	5/31/2018	14:47:00	15:05:00	67	Overcast	8	FLIR / BK 2 - 4440657				Thief hatches or other openings on a controlled storage vessel	1	5/31/2018	
2018053140.0	Quill Pad	5/31/2018	14:47:00	15:05:00	67	Overcast	8	FLIR / BK 2 - 4440657				Thief hatches or other openings on a controlled storage vessel	1	7/10/2018	
2018053140.0	Quill Pad	5/31/2018	14 47:00	15:05:00	67	Overcast	8	FLIR / BK 2 - 4440657				Thief hatches or other openings on a controlled storage vessel	1	5/31/2018	
2018053140.0	Quill Pad	5/31/2018	14:47:00	15;05:00	67	Overcast	8	FLIR / BK 2 - 4440657				Thief hatches or other openings on a controlled storage vessel	1	7/30/2018	FLIR / Bakken 2 - 44400657
201806019.0	Christensen Pad	6/1/2018	07:55:00	08:14:00	64	Partly Cloudy	11	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	1	6/1/2018	
201806019.0	Christensen Pad	6/1/2018	07:55:00	08:14:00	64	Partly Cloudy	11	FLIR / BK 2 - 4440657				Thief hatches or other openings on a controlled storage vessel	1	7/6/2018	FLIR / Bakken 2 - 44400657
2018060111.0	Darcy / Evelyn- Patrick Pad	6/1/2018	08:20:00	08:47:00	64	Overcast	11	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	1	6/1/2018	
2018060111.0	Darcy / Evelyn- Patrick Pad	6/1/2018	08:20:00	08:47:00	64	Overcast	11	FLIR / BK 2 - 4440657				Thief hatches or other openings on a controlled storage vessel	1	7/6/2018	FLIR / Bakken 2 - 44400657

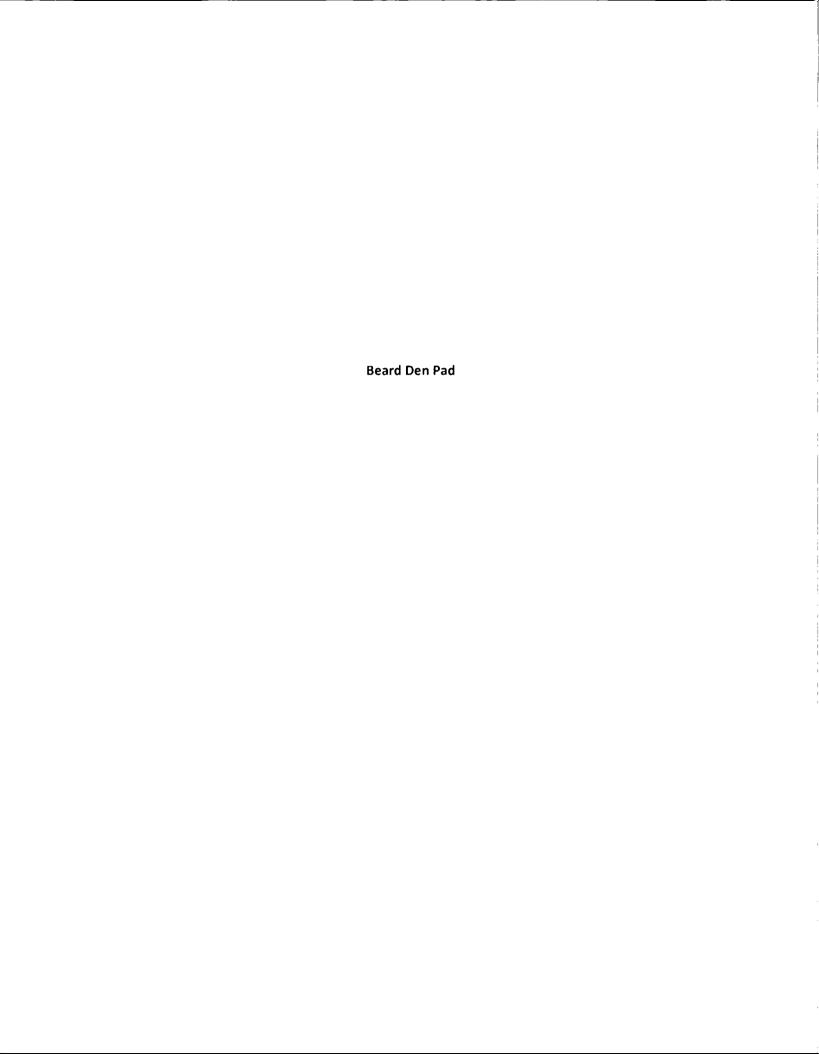
No	Identification of Each Affected Facility		Time	Survey End Time	Ambient Temperature During Survey	Sky Conditions During Survey	Maximum Wind Speed During Survey	Instrument Used	2nd Monitoring Instrument Used	Name of Surveyor	Deviations From Monitoring Plan If none State none	Component for which Fugitive Emissions Detected	Which Fugitive Emissions Detected	Successful Repair of Fugitive Emissions Component	Type of Instrument Used to Resurvey Components Not Repaired During Original Survey
2018060111.0	Darcy / Evelyn- Patrick Pad	6/1/2018	08:20:00	08:47:00	64	Overcast	11	FLIR / BK 2 - 4440657		(b) (6)	No	Thief hatches or other openings on a controlled storage vessel	1	6/1/2018	
2018060111.0	Darcy / Evelyn- Patrick Pad	6/1/2018	08:20:00	08.47:00	64	Overcast	11	FLIR / BK 2 - 4440657				Thief hatches or other openings on a controlled storage vessel	1	7/10/2018	FLIR / Bakken 2 - 44400657
2018060515.0	Marlin 14 Pad	6/5/2018	09:50:00	10:23:00	72	Partly Cloudy	7	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	1	6/6/2018	
2018060515.0	Marlin 14 Pad	6/5/2018	09:50:00	10:23:00	72	Partly Cloudy	7	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	1	6/15/2018	FLIR / Bakken : - 44400657
2018060515.0	Marlin 14 Pad	6/5/2018	09:50:00	10:23:00	72	Partly Cloudy	7	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	1	6/6/2018	
2018060515.0	Marlin 14 Pad	6/5/2018	09.50.00	10:23:00	72	Partly Cloudy	7	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	1	6/15/2018	FLIR / Bakken : - 44400657
2018060523.0	Delia USA pad	6/5/2018	12:00:00	12:37:00	75	Partly Cloudy	7	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	1	6/6/2018	
2018060523.0	Delia USA pad	6/5/2018	12:00:00	12:37:00	75	Partly Cloudy	7	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	4	6/15/2018	FLIR / Bakken ; - 44400657
2018060523.0	Delia USA pad	6/5/2018	12:00:00	12:37:00	75	Partly Cloudy	7	FLIR / BK 2 - 4440657			No	Thief hatches or other openings on a controlled storage vessel	1	6/6/2018	

No	Each Affected Facility	Date of Survey	Time	Survey End Time	Ambient Temperature During Survey	Sky Conditions During Survey	Maximum Wind Speed During Survey	Instrument Used	2nd Monitoring Instrument Used	Name of Surveyor	Deviations From Monitoring Plan If none State none			Successful Repair of Fugitive Emissions Component	Type of Instrument Used to Resurvey Components Not Repaired During Original Survey
2018060523.0	Delia USA pad	6/5/2018	12:00:00	12:37:00	75	Partly Cloudy	7	FLIR / BK 2 - 4440657		(b) (6)	No	Thief hatches or other openings on a controlled storage vessel	1	6/15/2018	FLIR / Bakken 2 - 44400657
2018062820.0	Myrmidon- Hunts Along Pad	6/28/2018	11:47:00	12:57:00	82.1	Partly Cloudy	6.4	FLIR / Insight - 44401177			No	Thief hatches or other openings on a controlled storage vessel	1	6/28/2018	
201807028.0	Sherman Pad	6/28/2018	10:06:00	10:30:00	81.7	Partly Cloudy	7.8	FLIR / Insight - 44401177			No	Thief hatches or other openings on a controlled storage vessel	1	6/28/2018	
201807028.0	Sherman Pad	6/28/2018	10:06:00	10:30:00	81.7	Partly Cloudy	7.8	FLIR / Insight - 44401177			No	Thief hatches or other openings on a controlled storage vessel	1	7/31/2018	
201807028.0	Sherman Pad	6/28/2018	10:06:00	10:30:00	81.7	Partly Cloudy	7.8	FLIR / Insight - 44401177			No		0	6/28/2018	
201807028.0	Sherman Pad	6/28/2018	10:06:00	10:30:00	81.7	Partly Cloudy	7.8	FLIR / Insight - 44401177			No		0	7/31/2018	
2018073122.0	Bear Den Pad	7/31/2018	08:34:00	11:10:00	73	Sunny	14.9	FLIR / Insight - 44401177			No	Thief hatches or other openings on a controlled storage vessel	1	7/31/2018	
2018073122.0	Bear Den Pad	7/31/2018	08:34:00	11:10:00	73	Sunny	14.9	FLIR / Insight - 44401177			No	Thief hatches or other openings on a controlled storage vessel	1	7/31/2018	
2018073122.0	Bear Den Pad	7/31/2018	08:34:00	11:10:00	73	Sunny	14.9	FLIR / Insight - 44401177			No	Thief hatches or other openings on a controlled storage vessel	1	7/31/2018	
2018073122.0	Bear Den Pad	7/31/2018	08:34:00	11:10:00	73	Sunny	14.9	FLIR / Insight - 44401177			No	Thief hatches or other openings on a controlled storage vessel	1	7/31/2018	
2018073122.0	Bear Den Pad	7/31/2018	08:34:00	11:10:00	73	Sunny	14.9	FLIR / Insight - 44401177			No		0	7/31/2018	

Facility Record	Identification of	Date of Survey	Survey Begin	Survey End	Ambient	Sky Conditions	Maximum Wind	Monitoring	2nd Monitoring	Name of	Deviations From	Type of	Number of Each	Date of	Type of
No.	Each Affected Facility		Time	Time	Temperature During Survey	During Survey	Speed During Survey	Instrument Used	Instrument Used	Surveyor		which Fugitive Emissions	Which Fugitive Emissions Detected	Repair of Fugitive Emissions	Instrument Used to Resurvey Components Not Repaired During Original Survey
2018073122.0	Bear Den Pad	7/31/2018	08:34:00	11:10:00	73	Sunny	14.9	FLIR / Insight - 44401177		(b) (6)	No		0	7/31/2018	

Appendix H- Certification signed by the qualified professional engineer for each closed vent
system routing to a control device.

Appendix H- Certification signed by the qualified professional engineer for each closed vent system routing to a control device.





Bear Den Facility Tank Battery Vent Line Design & Capacity Assessment

	(b) (6)	
TO:	Marathon Oil	
FROM:	Tim Archuleta	
CC:	Nate Mascarenas, Kendra Meeker	
DATE:	June 29, 2017	
RE:	Bear Den Facility- Vent Line Design and Capacity Assessment	

The US EPA finalized "Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After September 18, 2015" on June 3, 2016. This regulation has requirements for certifying the design of closed vent systems. An assessment of the closed vent must be performed to determine it is of sufficient design and capacity to ensure that all emissions from storage vessels are routed to the control device or process and have it certified by a qualified professional engineer. This regulation is 40 CFR 40 Subpart 0000a, referred to as the Quad Oa regulation.

Certification for 40 CFR 60.5411a(d):

"I certify that the closed vent system design and capacity assessment was prepared under my direction or supervision. I further certify that the closed vent system design and capacity assessment was conducted and this report was prepared pursuant to the requirements of subpart Quad Oa of 40 CFR part 60. Based on my professional knowledge and experience, and inquiry of personnel involved in the assessment, the certification submitted herein is true, accurate, and complete. I am aware that there are penalties for knowingly submitting false information."

Purpose:

Evaluate the new Bear Den Facility tank battery vent line design to ensure that the Enardo ES-660 thief hatches, which are set at 16 oz/in^2 will not open during normal operating flow rate scenarios. The normal flow path for the vapor from the storage tanks will be to one flare where the off gas will be combusted to meet Quad Oa regulations.

Results:

Based on the 3D model of the vent system and predicted vapor flow rates, Halker Consulting evaluated the pipe routing from the storage tanks to the flare and calculated the expected pressure drop in the system during the Marathon Oil specified maximum predicted vapor flow rates. The pressure at the outlet of the flare was set at local atmospheric pressure of approximately 13.5 psia. Pressure drop through the piping system from the furthest storage tank to the flare was calculated and found to have a backpressure on the tank battery of 0.4 psig (6.1 oz/in²g).

During normal operating conditions, $6.1 \text{ oz/in}^2\text{g}$ pressure should be the highest pressure that the tanks will see and is 40% of the of $16 \text{ oz/in}^2\text{g}$ set pressure of the thief hatch.

A flare tip pressure drop of 0.0 oz/in² was used and was based on information provided by Steffes Flare systems for the Air Assist Model 4. The flame arrestor pressure drop used was 0.9 oz/in² and is based on the Enardo sizing program for a 4" Series 8 inline flame arrestor.

The total gas flow rate to the flare used was 241 mscfd (771 lb/hr), and is based on a condensate flash factor and gas composition provided by Marathon Oil. The gas composition used was the average composition from the February 2017 Clarks Creek (MM) Analysis Summary. Credit was taken for the VRT thereby reducing the amount of flashed gas that was calculated using the provided flash gas factor.

Using the same calculation methodology, the total gas flow rate can be increased to 380 MSCFD (1216 lb/hr) and stay below the opening pressure of an Enardo ES-660 thief hatch (14.4 oz/in 2). This is approximately 1.57 times the normal operating flow.

Standard pressure drop "K" value for fittings and valves per Crane Technical Paper 410 were used. The value used for the absolute roughness of steel was 0.00015 ft.

*Attached are the tabulated results of the hydraulic calculations

Disclaimer:

This assessment meets the certification requirements of 40 CFR part 60 subpart 0000a. It is the responsibility of *Marathon Oil* to comply with the reporting requirements of this regulation.

This evaluation does not consider the destructive efficiency of the controlled device or components upstream of the tank vent design.

Attachment 1- Hydraulic Calculations

W- 1			nydraulic C	alculations												
Client Project:	Warsthon Or TVCS West II			Notes ->												
Location	Bear Den Fa			Peter -												
Jinit: Proj it	18039-18		Ain Pres	13.5	also.	Mar	Outlet	ко	Before		3	2	1			
ByChke			Pres Uni		fare to	KO	of KO	-	KO Drum	toris	Brita	tanks	tank			
ReviDate:	1.3563	28-Jun-17	- 8	EGMENT ID	G	H	1	1	K	L	M	N	0			
Pressure		egment ID or known Segment ID or known		pain	13.50	-	h .	10000	-	7 0	11000	n.	1000	-	Let Co	
Data		essure Up or Downs		pena DIT	4		4	1	4	- 1	0	- 6	4			1
ric Method	(Henry I'm	SWIP-Duller, S-E. M. C	rdingg & C.Sri	silvens)	15000		100	13.55	CARLY	1000	F 1986-8.	5670	- 1	5.00		
to Say Vich	Pipe Rough	Highest In. M.	-BIR S-Edv		0.00015	8,00015	0.00018	0,00013	0.00015	0.00015	0.000n5	0.00018	0.00015			155
Ppe		Size or Internal Di	ande	Inches	4.000	4,000	6.000	36.000	6.000	4.000	4.000	4.000	4.000			
		0; std. elc.) Blank #	ID, given abo	DVR .	1.0	980 84.0	slid 1.0	#00 #10	1.0	912 358.5	15.0	#14 15.0	910 15.0		2000	
Eev-	Straight pipe Inlet & Outlie	angn_	krist	-	1.0	94.0	- 10	8.0	1.0	208.5	12.0	10.0	15.0			1
tion	OR	-	Outer		- 44	- 44	44			100	- 44			-39	565	G-1
	Difference 90's	(Outlet - Intel) Std (R/D=1), three	Difference	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1		-
	1	Short Radius (R/I	D+1), fg6/will	foed	10000		100000	10.00	THE STREET	0.500	7000	PT-D		0.00	200.00	117
IX Method	971	Standard (R/D+1	5), all types 1 weld (90 c	for annia)		1	1	-			-		No.	1 300		-
		Mared	2 weig (45 c	feg angle)		2	1000	1000					100			1.
	Characher	Chatha Book	3 weld (30 c			1000	2500	300	12 900	STOP		1000	200	200		133
	Choose type	Plug Valve Branch Plug Valve Straigh	i Thru				3 2000		-	-		200	-	0.221	1	-
	45%	Short Radius (R/ Standard (R/D=1	O=1), all type	1			1	1-00	52.3		3	-1000	10000	N 5-195		
bows	45'1	Standard (R/D+1 Milered, 1 weld, 4	5, at types 5 dec arrie			-	100	-	-		-				1	
		Mared 2 weld 2	2.5 deg arga		1-5-2		2 2		11000			0	100	W.		
	Choose hos					The sale		-	1000	-3-5-5			artered.	-	ATIL	1
	1671	Close Return (R) Close Return (R)	D+1), Redive	(Ced)	11 2 13				200	-			-	1	100	
	180	Close Return (R) Standard (R/C+1	5), all tipes			-	1.50			-		1000	10-11-1		_	
	Ubad	Standard (R/D+1) Long-radius (R/D		ed l	Tre-series			1	2000				A COL	-	125	
	Mr.	Standard (R/D+1)), flanged or v		55,135	1200		7	-	3		-0.54	1	Will Street		2
ees	Flow -	Stub-in type brand Threaded	ch				7	10000	1000	-	-	1		250	1	0.00
	Bry.	Flanged or Welde			No.	150	1	2 3	1000	3	1	1	2 - JE	1000	5.000	
	Tee	Stub-in type brand Full line size, But	ch				1000000	200	4.000	-	-	100000	1135.3	200		136
	Gale, Ball or	Reduced from Bir						1						-		-
	Plug	Reduced trim, Be						12000	5=57		0 7		0-25	8.40	1000	100
aves.	Globe, eland	lard (a or Y-type) or Disc	degree interes	-	-	-	-	-	-		-	100	-	-	7	-
244	Butterfy						1000	200			-		775		1000	150
		Lift - min vel (N)					-	1200			1		10000		5300	
	Check	Swing - min vei () Tilling-disk	tia)+ epipen	# Batilut			1000	-	200	1			100		7.00	1
	Pige Entranc	e Exit 7(0×none, 1×4	rit. 2-ed.)	+ both)		100	1	10000	2			1	1.5	2500	description	
Dear	Swape to Diam Oritice Diam	emeter (al end)	_	'n		1200	4,000	-	-	6.000	-	-	-	-	-	-
DP DP	Initial Swage	ton Diameter		h	A CHES	2000	11		1.500			5500	15-20-	25.5	100	25
		ure Drop (Equip, etc		26	0.000	0.060		-	1	5.00		50.55	-	100		
	Valve Cv (No	Pressure Drop (Eq. in-flashing liquid or) is Flow Resistance	NO. OF I	grotper S X factor	1.00		1	-	1			-		FLYS	1	1
					1000	7.22	3320	1000	(200-	750		35000	2000	100		
bud	Flow (provide	e mass OR volume	0858)	gpm gpm			-	1	-			-	1100			-
	Density			10/13	(- C - V - E -	10-20-0	-	1500	1000		75-				V 10-10	200
2.04	Viscosity Surface Ten	sion (2 phase only)		eP dyne/cm	-	-	-	-			-				-	-
	Flow Rate			D/W	771.26	771.25	771.26	771.26	771.26	771.28	771.26	514,17	257.09	1000	25.3	
	Density DR 1	W 241	Density	6/13	90.13	90.17	70.11	46.14	29.14	70.14	20.11	29.14	29.14	3000	15.57	
Vilipo/			Z		25.14 0.954	29.14	29.14 0.954	2914 0304	0.994	29.14 0.994	29.14 0.964	0.954	0.994	1200		
			Teng	F	115.0	115.0	-115.0	115.0	115.0	115.0	115.0	115.0	115.0		1	
pe ktana	Vapor Viscos Diameter	LPy		E2	0.010 4.025	0.010 4.025	6.065	9010 36.250	0.010 6.065	4.006	0.010 4.026	4.026	4.026			
P / Holdug	Calculation M	efforts			Duk/Hugh	DukHigh	DixHigh	DukHugh	DukHugh	DUATUR	DuNHugh	DukHigh	DukHugh			
	Flow rate Flow rate			b/v	0.0	0.0	0.0	00	0.0	0.0	0 00	0.0	00			
iquid	Density		4	gon bit3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			1
120	Viscosty	in Character		cP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
	Flow Rate	sion (2 phase only)		dyneicm	771	771	771	771	771	771	9.00 771	514	0.00 257			1
/apor	Vapor Viscos			cP.	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010			
		erage Pressure		paig	0.00	0.05	0.11	0.11	0.51	0.25	0.39	0.39	0.40			
_	Vapor Density Bulk Density			6/13	0.0642	0.0644	0.0647	0.0647	0.0647	0.0653	0.0660	0.0660	0.0661		_	
	Pipe Flow A:			62	0.0864	0.0684	0.2006	6.7771	0.2006	0.0884	0.0684	0.0884	0.0884			
low	Bulk Velocity			filter	37.77	37.62	16.51	0.49	15.51	37.09	36.72	24.47	12.23			
Parsi-	Erosional Ve Average Vec	locity if solids press	1	f/sec cP	394.79 0.010	994,02	393.25 0.010	0.010	393.21	391.24 0.010	389.25	389.14	389.09			
	Elevation Chi	ings (Outlet-Inlet)			0.0	0.0	0.0	0.0	0.0	0,0	0.0	0.0	0.0			
reters.	Reynolds No Friction Fact	rober (NRs) ort (Colebrook & V	Minter.		1.18E+05 0.0197	1.18E+05 0.0197	7.86E+04 0.0302	1.35E+04 0.0286	7.86E+04 0.0202	1.18E+05 0.0197	1,18E+05 0,019/7	7.89E+04 0.0258	3.95E+04 0.0234			-
	K (straight p	pt)			0.06	4:92	0.04	0.08	0.04	21.01	88.0	0.93	1.05			
- 1	K (fillings + v	alves)	office)		0.00	0.55	0.57	8.00	1.02	6.72 0.31	0.18	0.18	0.61			
riction		+ eid + swages + o rous Flow Resistan		Nr.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			1
	Total K	1			0.06	5.47	1.65	0.08	1.06	28.04	1.06	1,11	2.09			
	Velocity Hear Equivalent le	d (Average Density noth	DATE:	11/10	1.0	22 00 93.4	4.24	8.0	4.24 26.4	21.38 478.4	20.95 18.1	9.50	2.32			
		essure before CV		psig	0.0006	0.1045	0.1077	0.1077	0.10969	0.382	0.392	0.397	0.400	e.	6.1	or to 2
		stream Control Valv	e DP	peg		1	1	-	0.10309	0.362	0,302	0.357	0.00		.,	or.in2
	Segment Up	stream pressure	-	psig	0.00	0.10	0.11	0.11	0.11	0.38	0.29	0.40	0.40			
OTAL		Pressure Drop ure Drop (Equip &)	Mod	psi	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			1
	Friction Pres	sure Dirap	-U(M)	ps ps	0.00	0.06	0.00	0.00	0.00	9.27	0.01	0.00	0.00			
11	Acceleration	Factor			1.45E-00	1,450-03	2.805-04	2.456-07	2.80E-04	1.416-03	1.36E-03	6.14E-04	1,535-04			
	Fotal System	Pressure Drop whatream Pies , by	elbra C.V.	28 G	0.00	0.00	6.00	8.51	0.00	0.27	8.36	0.00	8.49			
	Secret 25			275							k.					1
	Available Do	whateum Control (or Control Valve	Notice DIP	26	0.0000	0.0006	0.1045	0.1077	0.1077	0.1017	6.3821	0.3923	0.3971			

Beck Pad CTB



BECK FACILITY TANK BATTERY VENT LINE DESIGN AND CAPACITY ASSESSMENT

	addition.
Marathon Oil	(b) (6)
John Van Pelt	A S
Tim Archuleta, Nate Mascarenas, Kendra Meeker	
June 12, 2017	1
BECK Facility- Vent Line Design and Capacity Assessment	
	John Van Pelt Tim Archuleta, Nate Mascarenas, Kendra Meeker June 12, 2017

The US EPA finalized "Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After September 18, 2015" on June 3, 2016. This regulation has requirements for certifying the design of closed vent systems. An assessment of the closed vent must be performed to determine it is of sufficient design and capacity to ensure that all emissions from storage vessels are routed to the control device or process and have it certified by a qualified professional engineer. This regulation is 40 CFR 40 Subpart 0000a, referred to as the Quad Oa regulation.

Certification for 40 CFR 60.5411a(d):

"I certify that the closed vent system design and capacity assessment was prepared under my direction or supervision. I further certify that the closed vent system design and capacity assessment was conducted and this report was prepared pursuant to the requirements of subpart Quad Oa of 40 CFR part 60. Based on my professional knowledge and experience, and inquiry of personnel involved in the assessment, the certification submitted herein is true, accurate, and complete. I am aware that there are penalties for knowingly submitting false information."

Purpose:

Evaluate the new Beck facility tank battery vent line design to ensure that the Enardo ES-660 thief hatches, which are set at 16 oz/in² will not open during normal operating flow rate scenarios. The normal flow path for the vapor from the storage tanks will be to one flare where the off gas will be combusted to meet Quad Oa regulations.

Results:

Based on the 3D model of the vent system and predicted vapor flow rates, Halker Consulting evaluated the pipe routing from the storage tanks to the flare and calculated the expected pressure drop in the system during the Marathon Oil specified maximum predicted vapor flow rates. The pressure at the outlet of the flare was set at local atmospheric pressure of approximately 13.46 psia. Pressure drop through the piping system from the furthest storage tank to the flare was calculated and found to have a backpressure on the tank battery of 0.24 psig (3.9 oz/in²g).

During normal operating conditions the 3.9 oz/in²g pressure should be the highest pressure that the tanks will see and is 24% of the of 16 oz/in²g set pressure of the thief hatch.

A flare tip pressure drop of 0.0 oz/in² was used and was based on information provided by Steffes Flare systems for the Air Assist Model 4. The flame arrestor pressure drop used was 0.72 oz/in² and is based on the Enardo sizing program for a 4" Series 8 inline flame arrestor.

The total gas flow rate to the flare used was 213 mscfd (683 lb/hr), and is based on a condensate flash factor and gas composition provided by Marathon Oil. The gas composition used was the average composition from the February 2017 Clarks Creek (MM) Analysis Summary. Credit was taken for the VRT thereby reducing the amount of flashed gas that was calculated using the provided flash gas factor.

Using the same calculation methodology, the total gas flow rate can be increased to 436 MSCFD (1396 lb/hr) and stay below the opening pressure of an Enardo ES-660 thief hatch (14.4 oz/in²). This is approximately 2.04 times the normal operating flow.

Standard pressure drop "K" value for fittings and valves per Crane Technical Paper 410 were used. The value used for the absolute roughness of steel was 0.00015 ft.

*Attached are the tabulated results of the hydraulic calculations

Disclaimer:

This assessment meets the certification requirements of 40 CFR part 60 subpart 0000a. It is the responsibility of *Marathon Oil* to comply with the reporting requirements of this regulation.

This evaluation does not consider the destructive efficiency of the controlled device or components upstream of the tank vent design.

Attachment 1- Hydraulic Calculations

			Hydraulic C	alculations										
Client	Marathon Oil		queaux C	Basis /	100									
Project	TVCS Went L	ine		Notes →	7		. 5		3	2	1	ex segment.		
Location: Unit	BECK Fedit	у				4"	6"		6"	4"	4			
Proj #:	16039-11		Am Pres	13.46	atm	Atlai	Outlet	ко	Before	full flow	Halfof			
ByChkid	. JAP		Pres Uni		fare to	KO	ofKQ		KO Drum	to KO	tanks			
RevDate:		6-Jun-17		EGMENT ID	G	H		J	K	L	M			
Pressure		egment ID or kn a Segment ID or		psia	13.46	. 0	ħ	1	-	R	1			
Data	is known pro	essure Up or Do	wnstream (U	or Dy?	d	d	d	d	d	d	d		T	7.5
Fric Method	(bitameg 2 ort	dark-Outlier, 3-L-W.	F-Barge Britt, Sele	(thereal)										
Holdup Mich	Pipe Rough	2 =Hughmurk,3HL-I ness	44-050 3-03	tun)	0.00015	0.00015	0.80015	0.00015	0.00015	0.00015	0.00015			
Pipe	Nominal Lin	e Size or Interna	of Diameter	Inches	4 000	4 000	6.000	24.600	6.000	4 000	4.000	7	100000	200
	Schedule (4	0, std, etc.) Blan	k iff.D. given	above	611	64.2	8M	8.0	7.8	81d 222.2	157.5		-	
Elev	Straight pipe Inlet & Outle	i minger	inlet	1	1	1000				****	191.0			
aton	OR	(Outlet - Inlet)	Outlet		0.0	0.0	0.0	0.0	0.0	0.0	0.0	11-12-		
	Difference 90's	Std (R/D=1), th		-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	1	
	-	Short Radius (I	R/D=1), figd/	velded		100000	100	101/2004		La Contraction		100		
3K Method	90's	Standard (R/D	*1.5), all type 1.1 wald (90	deg angle)		3			100	-	2		/ b a	
		Misred		deg angle)						The second	1747			
	F	Plug Valve Bran	3 weld (30	deg angle)				100	1000			-		
	Choose type	Plug Value Strain	ight Thru				-	_	10000		1			
	45'8	Plug Value Strai Short Radius (R.O- Standard (R.O-	RO-1), all ty	pes					100			191		
Elbows	45's	Standard (R/D- Mitered, 1 weld	+1.5), all type			-				1				
		Mitered, 2 weld	1, 22.5 deg an	gle							BRIDGE SE			
	Choose type	Ball Valve Full F Close Return (Port				-							
	180's	Close Return d	R/D+1), findA	weided			-		-				1	
	180	Standard (R/D)	=1.5), all type	\$		15000								
-	Used	Standard (R/D) Long-redius (R												
	an	Standard (R/D	=1), flanged o		76.00	-				2	2	10000	10000	
Tees	Elbow	Stub-in type bro Threaded											1-1-1	
	Flow- thru	Flanged or Wei	ided			1				1	8			
	Tee	Stub-in type bro	anch											
	Gate, Ball	Full line size, B Reduced trim,	Retain 0 G				1							
	or Plug	Reduced trim.						11000			10.00		1000	1000
	Globe, stand		Seekeese is		100000000000000000000000000000000000000					2702				
Valves	Butterfy	le or Y-type) or D	saphragm (o	am type)	-									
		Lit - min vel (f	1/s)= 35/(den	s (b/ft3)*.5		17.0			7.00	2757	S	10000		
	Check	Swing - min vel	i (ft/s)= 40/(de	ens (b/ft3)^.5						7000	1	-		
	Pipe Entran	Titing-disk ce/Exit7(0=none,	1=entr. 2=ex	i(3-both)	70000		1		2	No. of the last	1			
	Swage to Di	ameter (at end)			12/10/2009		4.000			6.000				
Other	Orifice Diam	tom Diameter		in						0.00	110		_	
	Other Press	ure Drop (Equip.		pai & fluid	0.000	0.045				100				
		Pressure Drop (in-fashing liquid		gombs* 5										
	Macellaneo	us Flow Resists	ince	K factor						111111111111111111111111111111111111111				
	Flow (provid	e mass OR volum	me basis)	B/hr										
Liquid	Density			gpm B/R3								-		
	Viscosity			cP					100	7750	100000			
_	Surface Ten Flow Rate	sion (2 phase or	nlyj	dynalom	682.78	682.78	682.78	682.78	682.78	682.78	341.39	-		
	Density OR I	TASWA	Density	B/h/	002.70		100000							
Vapor			MW		29.14	29.14 0.994 115.0	29.14	29.14 0.994 115.0	29.14 0.994	29.14	29.14			
			Z Temp	F	0.994	115.0	0 994	115.0	115.0	0 994 115.0	0.994			
	Vapor Visco	sity	L. C.	cP	0.010	0.010	0.010	0.010	0.010	0.010	0.010			
	al Diameter p Calculation	Llathoda		in	4.026 Duk/Hugh	4.028 DukHugh	6 065 Dul/Hugh	23.250 Duk'Hugh	6 065 DukHugh	4.026 Dul/Hugh	4.026 Duk/Hugh			
UF / HORSE	Flow rate	10000		lb/hr	O	0	0	0	0	O	0			
	Flow rate			gpm b/83	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
Liquid	Density Viscosity			P#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
	Surface Ten	sion (2 phase or	mlyt	dyne/cm	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
Manage	Flow Rate			ib/hr	683 0,010	683	683 0.010	683	683	683	0.010			
Vapor	Vapor Visco Segment Av	sity erage Pressure		cP paig	0.00	0.04	0.08	0.010	0.09	0.010	0.010			
	Vapor Densi		*	8/83		0.0842	0.0844	0.0644	0.0844	0.0647	0.0650			
	Bulk Density		,	6/83	0.08	0.06	0.06	0.06	0.06	0.06	0.07			
	Pipe Flow A			82		0.0884	0.2006	2.9483	0.2006	0.0584	0.0884			
Flow	Bulk Velocity Erosional W	slocity if solids p	resent	f/sec		33.43	14.69 394.16	394.14	14.68 394.13	33.17	16.49 392.11			
Para-	Average Visi	cosity		cP	0.010	0.010	0.010	0.010	0.010	0.010	0.010	1		
meters	Bernston Ch	ange (Outlet-Inle umber (NRe)	nt)		0.0 1.05E+05	1.05E+05	0.0 6.96E+04	0.0 1.82E+04	6.98E+04	0.0 1.05E+05	5.24E+04			
THE STA	Friction Fact	orf (Colebrook	& White)		0.0200	0.0200	0.0206	0.0267	0.0206	0.0200	0.0222		1	
	K (straight p	(pe)			0.00	3.82	0.32	0.11	0.32	13.23	10.43			-
	K (Stings +)	raives) + exit + swages	+ oritor)		0.00	0.00	1.04	0.00	1.02	0.31	5.97 0.61			
Friction	K (Macellan	eous Flow Resi	istance + Vah	in CV)	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
	Total K	d (Average Deni	sity Pasies	# Buid	17.48	17.37	3.35	0.11	335	15.93	17,01	-		
	Equivalent is		and manual	K RUIG	0.0	81.1	36.8	8.0	32.6	267.5	256.8			
		ressure before (CV	psig	-	0.0822	0.0845	0.0845	0.00548	0.20898	0.242	· cs	3.9	oz.in2
	Available Up	stream Control	Valve DP	pe			-		Inc. or other wife	-				
TOTAL		Pressure Drop		peig		0.00	0.00	0.08	0.00	0.00	0.00			
TOTAL.	Other Press	ure Drop (Equip		pe	0.00	0.04	0.00	0.00	0.00	0.00	0.00			
	Friction Pres	sure Drop		pei	0.00	0.04	0.00	0.00	0.00	0.12	0.03			
	Acceleration Total System	Factor n Pressure Drop		pei	1.15E-03 0.00	1.15E-03 0.08	2.21E-04 0.00	1.02E-06	2.21E-04 0.00	1.13E-03 0.12	2.79E-04 0.03			
	Segment De	winsteam Pres	, before C.V.	psig	41	0.00	0.08	0.06	0.06	0.09	0.21			
	Available Do	wnsteam Cont er Control Valve	rôl Valve DP	psi		0.0000	0.0822	0.0845	0.0845	0.0865	0.2090			
	Error Status	or Consol Asias		psig	OK	OK	OK	OK	CK	CK	OK OK			
	ASSESSED NAMED IN				-								-	





GRADY FACILITY TANK BATTERY VENT LINE DESIGN AND CAPACITY ASSESSMENT

		THE PARTY OF THE P
TO:	Marathon Oil	(b) (6)
FROM:	Tim Archuleta	Ž.
CC:	Nate Mascarenas, Kendra Meeker	
DATE:	July 21, 2017	
RE:	Grady Facility- Vent Line Design and Capacity Assessment	

The US EPA finalized "Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After September 18, 2015" on June 3, 2016. This regulation has requirements for certifying the design of closed vent systems. An assessment of the closed vent must be performed to determine it is of sufficient design and capacity to ensure that all emissions from storage vessels are routed to the control device or process and have it certified by a qualified professional engineer. This regulation is 40 CFR 40 Subpart 0000a, referred to as the Quad Oa regulation.

Certification for 40 CFR 60.5411a(d):

"I certify that the closed vent system design and capacity assessment was prepared under my direction or supervision. I further certify that the closed vent system design and capacity assessment was conducted and this report was prepared pursuant to the requirements of subpart Quad Oa of 40 CFR part 60. Based on my professional knowledge and experience, and inquiry of personnel involved in the assessment, the certification submitted herein is true, accurate, and complete. I am aware that there are penalties for knowingly submitting false information."

Purpose:

Evaluate the new Grady facility tank battery vent line design to ensure that the thief hatches, which are set at 16 oz/in², will not open during normal operating flow rate scenarios. The normal flow path for the vapor from the storage tanks will be to one flare where the off gas will be combusted to meet Quad Oa regulations.

Results:

Based on the Marathon Oil verified tank orthos and predicted vapor flow rates, Halker Consulting evaluated the pipe routing from the storage tanks to the flare and calculated the expected pressure drop in the system during the Marathon Oil specified maximum predicted vapor flow rates. The pressure at the outlet of the flare was set at local atmospheric pressure of approximately 13.46 psia. Pressure drop through the piping system from the furthest storage tank to the flare was calculated and found to have a backpressure on the tank battery of 0.36 psig (5.5 oz/in²).

During normal operating conditions the 5.5 oz/in²g pressure should be the highest pressure that the tanks will see and is 36% of the of 16 oz/in²g set pressure of the thief hatch.





A flare tip pressure drop of 0 oz/in² was used and was based on information provided by Steffes Flare systems for the Air Assist Model 4. The flame arrestor pressure drop used was 1.1 oz/in² and is based on the Enardo sizing program for a 4" Series 8 inline flame arrestor.

The total gas flow rate to the flare used was 278 Mscfd (890 lb/hr), and is based on a condensate flash factor provided by Marathon Oil. The gas composition used was the average composition from the February 2017 Clarks Creek (MM) Analysis Summary. Credit was taken for the VRT thereby reducing the amount of flashed gas that was calculated using the provided flash gas factor.

Using the same calculation methodology, the total gas flow rate can be increased to approximately 455 Mscfd and stay below the opening pressure of an Enardo ES-660 thief hatch (14.4 oz/in²). This is approximately 1.63 times the normal operating flow.

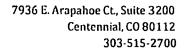
Standard pressure drop "K" value for fittings and valves per Crane Technical Paper 410 were used. The value used for the absolute roughness of steel was 0.00015 ft.

*Attached are the tabulated results of the hydraulic calculations and the vent isometric drawing.

Disclaimer:

This assessment meets the certification requirements of 40 CFR part 60 subpart 0000a. It is the responsibility of *Marathon Oil* to comply with the reporting requirements of this regulation.

This evaluation does not take into account the destructive efficiency of the controlled device or components upstream of the tank vent design.





Attachment 1- Hydraulic Calculations

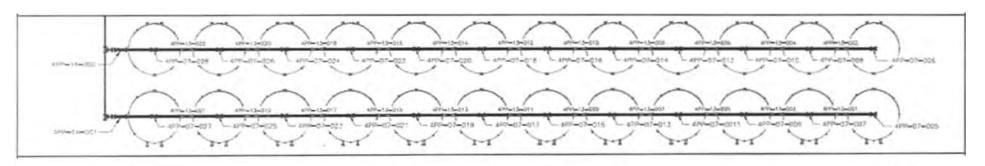


Unit	Marethon Ol TVCS Vanel			Basis /								
Location: Unit				Minted In			100			-		
	Grady Facilit			Notes ->	5		3	2	,	No segment		
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By/Chk'd		D.F	Pres Unit	-	tare to	CAMERICIALO	Drum	Upsteam	banks			
ReviDate:		21-Jul-17 agment ID or kno		GMENT ID	G	H	-	J	K			
Pressure	Upsteam S	egment ID or kno n Segment ID or i	own press.	psia psia	13.46							
Data		essure Up or Dov			d	d	ď	4	- 4			
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	Schedule (4 Straight pipe	0, std. etc.) Blank	iTI.D. given	sbove	1.0	79.0	4.0	160.0	200.0			
Elev-	Inlet & Outle	t	inlet			18.0	7.0	160.0	200.0			
ation	OR Difference	(Outlet - Inlet)	Outlet Difference	8	0.0	0.0	6.5	0.0	0.0			
	90's	Std (RJD=1), the	eaded				4.0					
SK Method	90's	Short Radius (R	UD=1), figd/s	relded					2			
N NETION	905	Standard (R.D.	1 weld (90	deg angle)		-			-			
		Mitered	2 weld (45	deg angle)		-	No. of Lot, House, St.					
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	Choose how	Mitered, 2 weld. Ball Value Full P.	az 5 deg an	gie				Photo de la constitución de la c			-	Contract of
		Close Return (F	RID=1), threa	ded		1000000		Name and	-	20000	-	
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	Too	Stub-in type bro					-		- 12			
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	or Plug	Reduced trim, 8										
	Globe, stand	fard										
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		Lit - min vel (t										
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Liquid				90m	the same of the							
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			Z Temp	F	0.994 115.0	115.0	0.994 115.0	8 994 115.0 0.010	0.994 115.0 0.010			
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	al Diameter p Calculation	Methods		in	4.026 DukHugh	4.026 Duk/Hugh	23 250 DukHugh	4.026 DukHugh	4.026 Duk/Hugh			
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Liquid	Viscosity			cP.	0.00	0.00	0.00	0.00	0.00			
	Surface Ten Flow Rate	sion (2 phase on	nly)	dyne/cm b-hr	890	0.00	890	0.00	0.00 445			-
Vapor	Vapor Visco	sity		cP	0.010	0.010	0.010	0.010	0.010			
	Segment Av	erage Pressure		palg	0.00	0.06	0.13	0.20	0.31			1
	Vapor Dens Bulk Densit		-	(b/E)	0.0640	0.0643	0.0646	0.0650	0.0655			-
	Pipe Flow A			82	0.0884	0.0884	2.9483	0.0884	0.07			1
Flow	Bulk Velocit	1	•	Bleec	43.89	43.48	1.30	43.04	21.35			
Para-	Erosional V Average Vis	elocity if wollds pr	resent	tisec of	395.33	394.41	393.49	392.38 0.010	390.84			
	Elevation Ch	ange (Outlet-Inle	0	t	0.0	0.0	0.0	0.0	0.0			1
meters		umber (NRe) or f (Colebrook I	A Whitel		1.40E+05 0.0193	1.40E+05 0.0193	2.42E+04 0.0249	1.40E+05 0.0193	6.98E+04 0.0212			
	K (straight p	ipe)	-		0.06	4.54	0.05	10.34	1264			
	K (fittings +	valves) + ext + swages	e orifice)		0.00	0.55	0.00	1.02	562			1
Priction	K (Miscellar	eous Flow Resis	stance + Valv	re Cv)	0.00	0.00	0.00	0.00	0.00			
	Total K	d (Average Dens	ity Basis)	# Buid	0.06 29.66	29.39	0.05	11.90 28.79	18.87 7.08			-
	Equivalent l	ength		E BUIC	1.0	99.1 0.1265	4.0	207.2 6.28138	298.6			
	Upstream P	ressure before Costream Control \		psig	0.0008	0.1265	0.12654	0.28138	0.34217	68	5.47	02.ln2
		pstream Control \		paig	0.00	0.13	0.13	0.28	0.34			
TOTAL	Static Head	Pressure Drop		psi	0.00	0.00	0.00	0.00	0.00			
	Friction Pres	ure Drop (Equip	a relow)	psi psi	0.00	0.05	0.00	0.00	0.00			
	Acceleration	Factor		1	1.96E-03	1.94E-03	1.73E-06	1.90E-03	4.68E-04			1
	Segment De	n Pressure Drop ownsteam Pres.	before C.V.	paig	0.00	0.13	0.00	0.15	0.06			1
	Available De	whsteam Cont	8 Valve DP	pai	*		*	r				1
	Pressure at Error Status	ter Control Valve		perg	9,0000 OK	0.0008 CK 278	9.1265 CK	0.1265 CK	0.2814 OK	1		



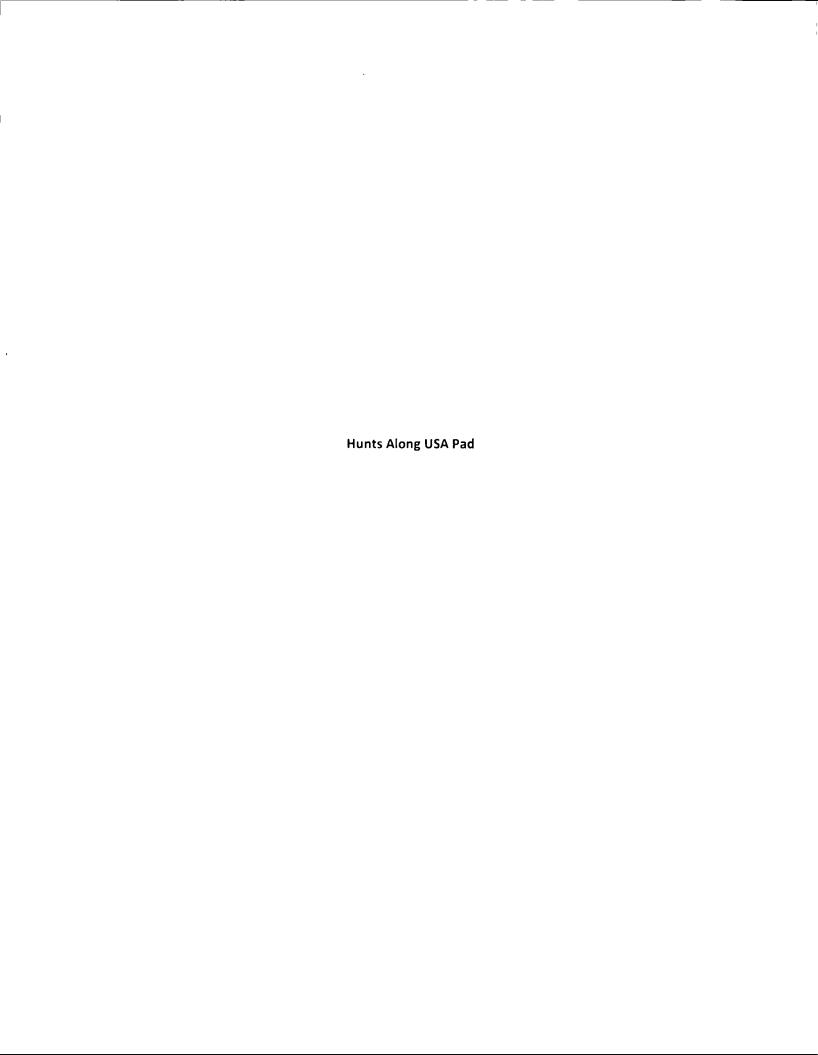
Attachment 2- Tank Vent Orthos











MITTER



Hunts Along Facility Tank Battery Vent Line Design & Capacity Assessment

		55 100 LIST
TO:	Marathon Oil	(b) (6)
FROM:	Tim Archuleta	
CC:	Nate Mascarenas, Kendra Meeker	
DATE:	July 19, 2017	
RE:	Hunts Along Facility- Vent Line Design and Capacity Assessment	

The US EPA finalized "Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After September 18, 2015" on June 3, 2016. This regulation has requirements for certifying the design of closed vent systems. An assessment of the closed vent must be performed to determine it is of sufficient design and capacity to ensure that all emissions from storage vessels are routed to the control device or process and have it certified by a qualified professional engineer. This regulation is 40 CFR 40 Subpart 0000a, referred to as the Quad Oa regulation.

Certification for 40 CFR 60.5411a(d):

"I certify that the closed vent system design and capacity assessment was prepared under my direction or supervision. I further certify that the closed vent system design and capacity assessment was conducted and this report was prepared pursuant to the requirements of subpart Quad Oa of 40 CFR part 60. Based on my professional knowledge and experience, and inquiry of personnel involved in the assessment, the certification submitted herein is true, accurate, and complete. I am aware that there are penalties for knowingly submitting false information."

Purpose:

Evaluate the new Hunts Along Facility tank battery vent line design to ensure that the Enardo ES-660 thief hatches, which are set at 16 oz/in², will not open during normal operating scenarios. The normal flow path for the vapor from the storage tanks will be to two flares where the off gas will be combusted to meet Quad Oa regulations.

This tank battery is comprised of three different production trains; Hunts Along, Shoots and Demaray with separate tank vent headers and flare knock out drums which then combine into a single flare header that flows to two flares.

Results:

Based on the 3D piping model (dated 7/19/17) of the vent systems and predicted vapor flow rates, Halker Consulting evaluated the pipe routing from the storage tanks to the flare and calculated the expected pressure drop in the systems during the Marathon Oil specified maximum predicted vapor flow rates. The pressure at the outlet of the flare was set at local atmospheric pressure of approximately 13.5 psia. Pressure drop through the piping systems from the furthest storage tank to the flare was calculated for each of the three production trains. The maximum pressures of the tanks occur on different days of production and are:

Hunts Along: 5.1 oz/in2g

Shoots: 8.7 oz/in²g

Demaray: 7.7 oz/in2g

A flare tip pressure drop of 0.0 oz/in² was used and was based on information provided by Steffes Flare systems for the Air Assist Model 4. The flame arrestor pressure drops used is based on the Enardo sizing program for a 6" Series 8 inline flame arrestor.

Because this tank vent system is composed of three individual trains each having their own peak rate, each train's peak rate, which occur on different days due to well staggering, were evaluated to determine the maximum pressure at the tanks for each train. It was determined that the maximum pressure for each train is attained at the peak flow rate for each train. The gas composition used was the average composition from the February 2017 Clarks Creek (MM) Analysis Summary. Credit was taken for the VRT on Hunts Along thereby reducing the amount of flashed gas that was calculated using the provided flash gas factor. Shoots and Demaray do not have VRTs installed therefore no reduction in tank vapor rate was applied.

	Day 1: Shoo	ots Peak Rate		naray Peak Rate / m Peak Rate	Day 22: Hunt	s Along Peak Rate
	CTB Flowrate [Mscfd]	CTB Tank Pressure [osig]		CTB Tank Pressure [osig]	CTB Flowrate [Mscfd]	CTB Tank Pressure [osig]
Hunts Along CTB	90	2.1	159	4.9	208	5.1
Shoots CTB	551	8.7	422	7.4	288	3.8
Demaray CTB	0	1.3	394	7.7	226	3.3
Total System	641		975		722	

Using the same calculation methodology, the total gas flow rate can be increased to approximately 1,303 Mscfd and stay below the opening pressure of an Enardo ES-660 thief hatch (14.4 oz/in²). This is approximately 1.3 times the normal operating flow. The flow was increased by an equal factor of 13% applied to the maximum forecast tank vapor rates for each of the three trains.

Standard pressure drop "K" value for fittings and valves per Crane Technical Paper 410 were used. The value used for the absolute roughness of steel was 0.00015 ft.

*Attached are the tabulated results of the hydraulic calculations

Disclaimer:

This assessment meets the certification requirements of 40 CFR part 60 subpart 0000a. It is the responsibility of *Marathon Oil* to comply with the reporting requirements of this regulation.

This evaluation does not consider the destructive efficiency of the controlled device or components upstream of the tank vent design.

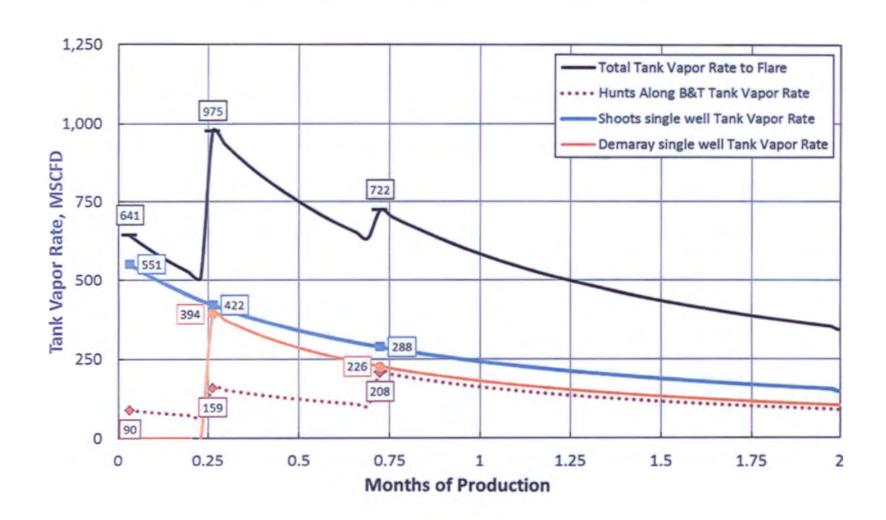
Attachment 1 - Normal Tank Vent Flow Rates

0



MARATHON HP/LP Flare Capacities

Normal flow rates based on Demaray single well facility being staggered to begin production (1) week after first Hunts Along well. Shoots single well facility begins production with first Hunts Along well.





Attachment 2 – Hunts Along Peak Rate Hydraulic Calculations

1 13.5 t psis	atm flare stack and lip	Downstream of 1st Flare	Common Discharge	Hunts Along KO Outlet		Hunts Nong Flare Header	Fr Rw Hunts Along Vent Header	Shoots KO Outlet	Shoots KO Drum		Shoots T-5040 Vent Header	Shoots T-5050 Vent Jumper	Shoots T-5560 Vent Jumper	Demaray KO Outlet		Demaray Flare Header		No. of the last
psia psia	13.50	G	н	the latest and	3	R	L		N	0	P	0	R	-	T	U	V	
or D)?	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	
othermal) ton)												NAME OF TAXABLE PARTY.		ACCOUNTS OF				
Inches	0.00015 4.000	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015 4.000	0.00015 6.000	0.00015 24.000	0.00015 6.000	0.00015 6.000	0.00015 6.000	0.00015	0.00015 6.000	0.00015 24.000	0.00015 6.000	0.00015	
above	std 15.0	6.000 std	6.000 std	6.000 std	24,000 std	4.000 std	sid	std	sld 8.0	std	std	8 ld	4.000 stri	std	8.0	sid	std 55.0	
市	15.0	30.0	107.0	23.0	8.0	415.0	110.0	15.0	8.0	428.0	72.0	17.0	26.0	15.0	8.0	430.0	55.0	
ft ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
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CP CP	115.0 0.010	115.0 0.010	115.0 0.010	115.0 0.010	115.0 0.010	115.0 0.010	115.0 0.010	115.Q 0.010	115.0 0.010	115.0 0.010	115.0 0.010	115.0 0.010	115.0 0.010	115.0 0.010	115.0 0.010	115.0 0.010	115.0 0.010	- 1

alm flare stack and lip	Downstream of	Common	Hunts Along		And the second second	Fr Rw Hunts Along	Shoots KO Outlet	Shoots	Shoots		-	Shoots T-5560	Demaray	Demaray	Demaray	Demaray
G G	H	Discharge	KO Outlet	KO Drum	Flare Header	Vent Header M	N N	KO Drum	Flare Header	VentHeader	Vent Jumper	Vent Jumper	KO Outlet	KO Drum	Flare Header	W
4.026	6.065	6.065	6.065	23.250	4.026	4.026	6.065	23.250	6.065	6.065	6.065	4.026	6.065	23.250	6.065	4.026
Duk/Hugh	Duk/Hugh	Duk/Hugh	Duk/Hugh	Duk/Hugh	Duk/Hugh	DukHugh	Duk/Hugh	Duk/Hugh	Duk/Hugh	Duk/Hugh	Duk/Hugh	Duk/Hugh	Duk/Hugh	Duk/Hugh	Duk/Hugh	Duk/Hugh
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1155	1155	2311	666	666	666	333	922	922	922	922	922	922	723	723	723	723
0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
0.00	0.01	0.07	0.10	0.10	0.20	0.31	0.10	0.11	0.13	0.17	0.18	0.21	0.10	0.10	0.12	0.17
0.0642	0.0642	0.0645	0.0647	0.0847	0.0651	0.0656	0.0647	0.0647	0.0648	0.0650	0.0650	0.0652	0.0647	0.0647	0.0647	0.0650
0.06	0.06	0.06	0.06	0.06	0.07	0.07	0.06	0.06	0.06	0.06	0.07	0.07	0.06	0.06	0.06	0.06
0.0884	0.2006	0.2006	0.2006	2.9483	0.0884	0.0884	0.2006	2,9483	0.2006	0.2006	0.2006	0.0884	0.2006	2.9483	0.2006	0.0884
56.57	24.90	49.61	14.25	0.97	32.11	15.93	19.73	1.34	19.69	19.64	19.62	44.43	15.49	1.05	15.47	34.97
394.75	394.53	393.80	393.26	393.24	391.84	390.30	393.25	393.22	392.83	392.30	392.13	391.69	393.25	393.23	392.99	392.26
0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.81E+05	1.20E+05	2.41E+05	6.93E+04	1.81E+04	1.04E+05	5.22E+04	9.60E+04	2.50E+04	9.60E+04	9.60E+04	9.60E+04	1.45E+05	7.53E+04	1.96E+04	7.53E+04	1.13E+05
0.0187	0.0189	0.0173	0.0207	0.0267	0.0200	0.0222	0.0196	0.0247	0.0196	0.0196	0.0196	0.0192	0.0204	0.0262	0.0204	0.0198
0.84	1.12	3.67	0.94	0.11	24.73	7.29	0.58	0.10	16.58	2.79	0.66	1.49	0.60	0.11	17.33	3.24
0.00	0.50	0.51	0.40	0.00	0.98	5.50	0.32	0.00	1.02	3.48 0.61	0.94	1.57	0.58	0.00	1.70	3.78 0.92
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.84	1.63	4.18	1.95	0.11	26.73	12.79	1.51	0.10	19.98	6.87	2.21	3.97	1.60	0.11	20.05	7.94
49.73	9.63	38.25	3.16	0.01	16.03	3.94	6.05	0.03	6.03	5.99	5.98	30.68	3.73	0.02	3.72	19.00
15.0	43.4	121.8	47.8	8.0	448.6	193.0	39.1	8.0	515.7	177.4	57.0	69.4	44.6	8.0	497.5	134.7
0.0000	0.0297	0.1014	0.1042	0.10422	0.29817	0.32117	0.1056	0.10557	0.15977	0.17837	0.18434	0.23961	0.1045	0.10446	0.13797	0.20616
0.00	0.03	0.10	0.10	0.10	0.30	0.32	0.11	0.11	0.16	0.18	0.18	0.24	0.10	0.10	0.14	0.21
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#VALUE!	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.02	0.01	0.07	0.00	0.00	0.19	0.02	0.00	0.00	0.05	0.02	0.01	0.06	0.00	0.00	0.03	0.07
3.28E-03 #VALUE!	6.36E-04 0.03	2.53E-03 0.07	2.08E-04 0.00	9.65E-07 0.00	1.06E-03 0.19	2.60E-04 0.02	4.00E-04 0.00	1.85E-06 0.00	3.98E-04 0.05	3.95E-04 0.02	3.95E-04 0.01	2.03E-03 0.06	2.46E-04 0.00	1.14E-06 0.00	2.45E-04 0.03	1.25E-03 0.07
0.00	0.03	0.07	0.10	0.10	0.10	0.30	0.10	0.00	0.05	0.16	0.01	0.06	0.10	0.10	0.03	0.14
0.00	0.00	0.03	0.10	0.10	0.10	0.20	0.10		0.11	0.10	0.10	0.10	0.10	0.10	0.10	0.14
0.0000	0.0000	0.0297	0.1014	0.1042	0.1042	0.2982	0.1014	0.1056	0.1056	0.1598	0.1784	0.1843	0.1014	0.1045	0.1045	0.1380
OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
0.057	0.025	0.050	0.014	0.001	0.033	0.016	0.020	0.001	0.020	0.020	0.020	0.045	0.016	0.001	0.016	0,035
361,000	361 361,000	722,000	208,000	208,000	208,000	104,000	288,000	288 288,000	288,000	288 288,000	288 288,000	288,000	226,000	226,000	226,000	226,000



Attachment 3 - Shoots Peak Rate Hydraulic Calculations

13.5 psia GMENT ID:	atm flare stack and fip G	Downstream of 1st Flare	Common Discharge				Fr Rw Hunts Along Vent Header M		Shoots KO Drum			Shoots T-5050 Vent Jumper				Demaray Flare Header	
psia psia or D)?	13.50 d	G d	H d	i d	J	R d	L d	d	N d	Ö d	P	0	R	d	T d	U d	V d
n) ft inches	0.00015 4.000	0.00015 6.000	0.00015	0.00015	0.00015	0.00015	0.00015 4.000 sld 110.0	0.00015	0.00015	0.00015	0.00015 6.000	0.00015	0.00015 4.000	0.00015	0.00015 24.000 std 8.0	0,00015 6,000 sld 430.0	0.00015 4.000
bove ft ft	15.0 0.0	30.0 0.0	61d 107.0	81d 23.0	8.0 0.0	415.0	110.0	std 15,0	8 0 0 0	std 428.0	72.0	81d 17.0	8 ld 26.0	15.0 0.0	8.0	430.0	55.0 0.0
elded	0.0	2	0.0	1	0.0	3	1	0.0		0.0	2		2	1		1	2
leg angle) leg angle) leg angle)																	
18			1							2				1		2	
led alded																	
ded welded							2			2	1	1	1			1	1
			2	1		1	7			1	2						2
m type)																	
Ib/ft3)^.5 is Ib/ft3)^.5							1				1						1
3=both) in in						2							6.000				6.000
ft fluid gpm/psr.5 K factor	0.000	0.019															
ib/hr gpm ib/ft3 cP dyne/cm																	
lb/ft3	1026 20.14 0.904	1026 29.14 0.994	2051 29.140 0.994	268 29.140 0.994	288 29.14 0.994	288 29.14 0.994	144 29.14 0.994	1763 29.14 0.994	1763 20.14 0.994	1763 29,14 0.994	1763 29.14 0.994	1763 29.14 0.994	1763 29.14 0.994	0 29,14 0,994	0 29.14 0.994	0 29.14 0.994	0 29.14 0.994
F cP	115.0 0.010	115 0 0.010	115.0 0.010	115.0 0.010	115.0 0.010	115.0 0.010	115.0 0.010	115.0 0.010	115.0 0.010	115.0 0.010	115.0	115.0 0.010	115.0 0.010	115.0	115.0	115.0 0.010	115.0 0.010

1.5	atm flare stack and tip	Downstream of 1st Flare	Common Discharge	KO Outlet	THE RESERVE TO THE RE	Hunts Along Flare Header	Fr Rw Hunts Along Vent Header	Shoots KO Outlet	KO Drum	Shoots Flare Header		Shoots T-5050 Vent Jumper	Shoots T-6560 Vent Jumper	Domaray KO Outlet	Demaray KO Drum	Demarsy Flare Header	Demaray Vant Header
T ID.	G	H	1	J	K	L	M	N	0	P	Q	R	S	T	U	V	W
in	4.026	6.065	6.065	6.065	23.250	4.026	4.026	6.065	23.250	6.065	6.065	6.065	4.026	6.065	23.250	6.065	4.028
	Duk/Hugh	Duk/Hugh	Duk/Hugh	Duk/Hugh	Duk/Hugh	Duk/Hugh	Duk/Hugh	Duk/Hugh	Duk/Hugh	Duk/Hugh	Duk/Hugh	Duk/Hugh	Duk/Hugh	Duk/Hugh	DukHugh	Duk/Hugh	Duk/Hugh
lb/hr	0	0	Ô	0	0	0	0	0	0	0	0	0	0	0	0	0	0
mqg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
b/R3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
cP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
/cm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
b/hr	1026	1026	2051	288	288	288	144	1763	1763	1763	1763	1763	1763	0	0	0	0
cP	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.000	0.000	0,000	0.000
gisig	0.00	0.01	0.05	0.08	0.08	0.10	0.13	0.08	0.09	0.17	0.29	0.34	0.44	0.08	0.08	0.08	0.08
o/#13	0.0642	0.0642	0.0644	0.0646	0.0646	0.0647	0.0648	0.0646	0.0646	0.0650	0.0656	0.0658	0.0663	0.0000	0.0000	0.0000	0.0000
M3	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.00	0.00	0.00	0.00
ft2	0.0884	0.2006	0.2006	0.2006	2.9483	0.0884	0.0884	0.2006	2 9483	0.2006	0.2006	0.2006	0.0884	0.2006	2.9483	0.2006	0.0884
sec	50.22	22.11	44.09	6.18	0.42	14.00	6.99	37.81	2.57	37.56	37.24	37.12	83.59	0.00	0.00	0.00	0.00
sec	394.75	394.57	393.98	393.56	393.55	393.26	392.92	393.52	393.49	392.24	390.54	389.93	388.42	0.00	0.00	0.00	0.00
cP	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.000	0.000	0.000	0.000
ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
_	1.61E+05	1.07E+05	2.14E+05	3.00E+04	7.82E+03	4.52E+04	2.26E+04	1.84E+05	4.79E+04	1.84E+05	1.84E+05	1.84E+05	2.77E+05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.0190	0.0193	0.0176	0.0243	0.0331	0.0228	0.0261	0.0179	0.0214	0.0179	0.0179	0.0179	0.0180	0.0000	0.0000	0.0000	0.0000
	0.85	1.14	3.72	1.10	0.14	28.21	8.57	0.53	0.09	15.14	2.55	0.60	1.40	0.00	0.00	0.00	0.00
11	0.00	0.50	0.51	0.42	0.00	1.02	5.63	0.00	0.00	2.37	3.45	0.94	1.56	0.00	0.00	0.00	0.00
- II	0.00	0.00	0.00	0.61	0.00	1.02	0.00	0.00	0.00	0.00	0.61	0.61	0.92	0.00	0.00	0.00	0.00
- 11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
_	0.85	1.65	4.23	2.14	0.14	30.25	14.21	0.53	0.09	17.51	6.61	2.15	3.87	0.00	0.00	0.00	0.00
luid	39.19	7.60	30.20	0.59	0.00	3.04	0.76	22.21	0.10	21.92	21.55	21.41	108.58	0.00	0.00	0.00	0.00
В	15.0	43.2	121.7	44.6	8.0	445.0	182.3	15.0	8.0	495.0	186.8	60.7	72.1	0.0	0.0	0.0	0.0
gia	0.0000	0.0243	0.0816	0.0822	0.08216	0.12351	0.12836	0.0869	0.08689	0.26046	0.32540	0.34642	0.54137	0.0816	0.08159	0.08159	0.08159
psi	0.00	0.02	0.08	0.08	0.08	0.12	0.13	0.09	0.09	0.26	0.33	0.35	0.54	0.08	0.08	0.08	0.08
psi	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
psi	#VALUE!	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
psi	0.01	0.01	0.06	0.00	0.00	0.04	0.00	0.01	0.00	0.17	0.06	0.02	0.19	0.00	0.00	0.00	0.00
	2.59E-03	5.02E-04	1.99E-03	3.91E-05	1.81E-07	2.01E-04	5.01E-05	1.47E-03	6.79E-06	1.45E-03	1.42E-03	1.41E-03	7.17E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
psi	#VALUE!	0.02	0.06	0.00	0.00	0.04	0.00	0.01	0.00	0.17	0.05	0.02	0.19	0.00	0.00	0.00	0.00
psi	0.00	0.00	0.02	0.08	0.08	80.0	0.12	0.08	0.09	0.09	0.26	0.33	0.35	80.0	0.08	80.0	80.0
sig	0.0000	0,000	0.0243	0.0816	0.0822	0.0822	0.1235	0.0816	0.0869	0.0869	0.2605	0.3254	0.3464	0.0816	0.0816	0.0816	0.0816
77	OK 0.051	0K 0.022	OK	OK	OK	OK.	OK 0.007	OK	OK	OK	OK	OK 0.038	OK	OK	OK	OK	OK
MI	0.051		0.045	0.006	0.000	0.014	0.007	0.038	0.003	0.038	0.038		0.085	NA O	NA A	NA A	NA A
1	320,500		641,000	90,000	90,000	90,000	45,000	551,000	551,000	551,000	551 551,000	551 551,000	551,000	0	0	0	0



Attachment 4 – Demaray Peak Rate Hydraulic Calculations

13.5 psia GMENT ID:	atm flare stack and tip	Downstream of 1st Flare	Common Discharge	KO Outlet	KO Drum	Flare Header	Fr Rw Hunts Along Vent Header	KO Outlet	Shoots KO Drum		Vant Header	Shoots T-5050 Vent Jumper	Vent Jumper	KO Outlet	KO Drum	Flare Header	
psia psia psia or D)?	13.50 d	G d	H d	J d	J d	K d	t d	N d	N d	0 d	P d	R O d	R d	I d	T d	U	V
inches	0.00015 4.000 std 15.0	0.00015 6.000 std 30.0	0.00015 6.000 std 107.0	0.00015 6.000 std 23.0	0,00015 24 000 std 8.0	0.00015 4.000 std 415,0	0.00015 4.000 std 110.0	0.00015 6.000 std 15.0	0.00015 24.000 std 8.0	0.00015 6.000 std 428.0	0.00015 6,000 sld 72.0	0.00015 6.000 std 17.0	0.00015 4.000 813 26.0	0.00015 6.000 std 15.0	0.00015 24 000 std 8.0	0.00015 6.000 std 430.0	0.00015 4.000 std 55.0
ft ft ft elded	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ieg angle) ieg angle) ieg angle)		2				3					2		2				2
35 ile			1							2				1		2	
led elded ded																	
welded			2				7			2	2						2
m type)				1													
ib/ft3)^.5 is lb/ft3)^.5 3=both)				1		2	1	1		2	1		1 6.000			2	1 6,000
in in psi ft fluid gpmps/.5 K factor	0.000	0.037															
Ib/hr gpm Ib/ft3 cP																	
dyne/cm lb/hr lb/ht3	1560 29.14 0.994 115.0 0.010	1560 29.14 0.994 115.0 0.010	3120 29.140 0.994 115.0 0.010	29.140 0.994 115.0 0.010	29.14 0.994 115.0 0.010	29.14 0.994 115.0 0.010	254 29.14 0.994 115.0 0.010	1350 29.14 0.994 115.0 0.010	1350 29.14 0.994 115.0 0.010	29.14 0.994 115.0 0.010	29.14 0.994 115.0 0.010	29.14 0.994 115.0 0.010	29.14 0.994 115.0 0.010	1261 29.14 0.994 115.0 0.010	1261 29.14 0.994 115.0 0.010	29.14 0.994 115.0 0.010	1281 29.14 0.994 115.0 0.010

sia	atm flare stack and tip	Downstream of 1st Flare	Common Discharge	Hunts Along KO Outlet		Hunts Along Flare Header	Fr Rw Hunts Along Vent Header	Shoots KO Outlet	Shoots KO Drum	Shoots Flare Header		Shoots T-5050 Vent Jumper	Shoots T-5560 Vent Juniper	Demaray KO Outlet	Demaray KO Drum	Demaray Flare Header	Demaray Vent Header
T ID	G	H	- 1	J	К	L	M	N	0	P	0	R	S	T	U	V	W
in	4.026	6.065	6.065	6.065	23.250	4.026	4.026	6.065	23.250	6.065	6.065	6.065	4.026	6.065	23.250	6.055	4.026
	Duk/Hugh	DukHugh	Duk/Hugh	Duk/Hugh	Duk/Hugh	Duk/Hugh	Duk/Hugh	DukHugh	Duk/Hugh	Duk/Hugh	Duk/Hugh	Duk/Hugh	DuloHugh	Duk/Hugh	Duk/Hugh	Duk/Hugh	DukHugh
- Ib/hr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
gpm lb/ft3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1b/ft3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
cP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
eicm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
lb/hr	1560	1560	3120	509	509	509	254	1350	1350	1350	1350	1350	1350	1261	1261	1261	1261
cP	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
psig	0.00	0.02	0.11	0.18	0.18	0.24	0.30	0.18	0.19	0.24	0.31	0.34	0.40	0.18	0.19	0.23	0.38
Ib/ft3	0.0642	0.0643	0.0647	0.0650	0.0650	0.0653	0.0656	0.0650	0.0651	0.0653	0.0657	0.0658	0.0661	0.0650	0.0651	0.0653	0.0660
Ib/ft3	0.06	0.06	0.06	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
ft2	0.0884	0.2006	0.2006	0.2006	2.9483	0.0884	0.0884	0.2006	2.9483	0.2006	0.2006	0.2006	0.0884	0.2006	2.9483	0.2006	0.0884
Msec	76.39	33.60	66.76	10.84	0.74	24.48	12.18	28.75	1.96	28.63	28.47	28.42	64.20	26.84	1.83	26.74	60.05
Msec	394.75	394.39	393.11	392.18	392.17	391.34	390.41	392.13	392.07	391.29	390.23	389.87	388.97	392.13	392.07	391.40	389.33
cP	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2.45E+05	1.62E+05	3.25E+05	5.30E+04	1.38E+04	7.98E+04	3.99E+04	1,41E+05	3.67E+04	1.41E+05	1.41E+05	1.41E+05	2.12E+05	1.31E+05	3.43E+04	1,31E+05	1.98E+05
_	0.0182	0.0182	0.0168	0.0217	0.0285	0.0208	0.0233	0.0185	0.0226	0.0185	0.0185	0.0185	0.0184	0.0187	0.0230	0.0187	0.0186
-	0.81	1.08	3.56	0.99	0.12	25.69	7.65	0.55	0.09	15.68	2.64	0.62	1.43	0.55	0.09	15.90	3.04
II.	0.00	0.50	0.51	0.41	0.00	1.02	5.53	0.32	0.00	1.01	3.46 0.61	0.94 0.61	1.56 0.92	0.57	0.00	1.69	0.92
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.81	1.58	4.07	2.01	0.12	27.70	13.18	1.48	0.00	19.06	6.71	2.17	3.91	1.74	0.00	18.60	7.73
fluid	90.68	17.54	69.27	1.82	0.01	9.32	2.31	12.85	0.05	12.74	12.60	12.55	64.06	11.20	0.05	11.12	56.04
ft	15.0	43.9	122.3	46.7	8.0	447.5	189.6	40.4	8.0	520.5	183.1	59.2	71.1	47.0	8.0	503.1	139.6
psig	0.0000	0.0493	0.1765	0.1781	0.17812	0.29519	0.30905	0.1851	0.18506	0.29529	0.33386	0.34631	0.46171	0.1853	0.18525	0.27906	0.47816
psig	0.00	0.05	0.18	0.18	0,18	0,30	0.31	0.19	0.19	0.30	0,33	0.35	0.46	0.19	0,19	0.28	0.48
psi	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
psi	#VALUE!	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
psi	0.03	0.01	0.13	0.00	0.00	0.12	0.01	0.01	0.00	0.11	0.04	0.01	0.11	0.01	0.00	0.09	0.20
	5.99E-03	1.16E-03	4.57E-03	1.20E-04	5.58E-07	6.15E-04	1.52E-04	8.48E-04	3.93E-06	8.41E-04	8.32E-04	8.29E-04	4.23E-03	7.39E-04	3.42E-06	7.34E-04	3.70E-03
-psi	#VALUE!	0.05	0.13	0.00	0.00	0.12	0.01	0.01	0.00	0.11	0.04	0.01	0.12	0.01	0.00	0.09	0.20
psig	0.00	0,00	0.05	0.18	0.18	0.18	0.30	0.18	0.19	0.19	0.30	0.33	0.35	0.18	0.19	0.19	0.28
psig	0.0000	0.0000	0.0493	0.1765	0.1781	0.1781	0.2952	0.1765	0.1851	0.1851	0.2953	0.3339	0.3463	0.1765	0.1853	0.1853	0.2791
	OK 0.077	OK 0.034	0.068	0K 0.011	0.001	OK 0.025	0K 0.012	OK 0.029	OK 0.002	OK 0.029	OK 0.029	OK 0.029	OK	OK 0.027	OK.	0.027	OK 0.081
MI		488	975	0.011	159	159	0.012	422	0.002	422		422	0.065	394	0.002	394	394
101	488 487,500	487,500	975,000	159,000	159,000	159,000	79,500	422,000	422,000	422,000	422,000	422,000	422,000	394,000	394,000	394,000	394,000
hAIR	20.361	20.361	40,723	6.641	6.641	6.641	3,320	17.826	17,626	17,626	17,626	17,626	17.626	16,456	16,456	16,458	16,456



Attachment 5 - Maximum Flow Rate Hydraulic Calculations

13.5 psia	atm flare stack and tip	Downstream of 1st Flare	Common Discharge	KO Outlet	KO Drum	Flare Header	Fr Rw Hunts Along Vent Header	KO Outet		Flare Header	Shoots T-5040 Vent Header	Vent Jumper	Vent Jumper	KO Outlet		Demaray Flare Header	Vent Header
GMENT ID. psia	G	Н		J	K	L CONTRACTOR OF THE PERSON NAMED IN CONT	M	N	0	Р	Q	R	S	T	U	V	W
psia or D)?	13.50 d	G d	H	d	d	K	d d	1	N	0	d	Q d	R	d	7 d	0	ď
ermal)	100000		10000				PRODUCTION OF THE PERSON NAMED IN										
n)	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015
inches	4.000 std	6.000 std	6.000 std 107.0	8.000 std 23.0	24.000 std 8.0	4.000 std	4.000 std 110.0	6,000 std 15.0	24.000 std 8.0	6.000 std 428.0	6.000 std 72.0	6.000 std 17.0	4.000 atd 26.0	6,000 std 15.0	24,000 std 8.0	6.000 std 430.0	4.000 std 55.0
ft.	15.0	30.0	107.0	23.0	8.0	415.0	110.0	15.0	8.0	428.0	72.0	17.0	26.0	15.0	8.0	430.0	55.0
n n	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ded				The second	NAME OF BRIDE	No. of Concession,		Carlo Carlo								NAME OF THE OWNER, OWNE	THE REAL PROPERTY.
g angle)		2		1	PER MINISTER	3	1	ACCESSES.	Control of the	LINE DELICATION	2		2	1		1	2
eg angle) eg angle)	Marine Control			SECTION AND DESCRIPTION OF THE PERSON NAMED IN COLUMN TWO IN COLUMN TO THE PERSON NAMED IN COLUMN TWO IN COLUMN TW			A Company of Print			Control of	CONTRACT SOURCE	CONSTRUCTION	Michigan Company		District of the last of the la	Control de la co	
							STATE OF THE REAL PROPERTY.		DE ANIM			EU COCONO	NAME OF TAXABLE PARTY.		No.	REG. 10	
			1			NC IN LAND	ATTENDED	1		2	TO MAKE S		C. Tresente	1	FOR TOP IN	2	MARCH SE
			Contract of the				Name of Street										
d						AND LOCAL				PERSONAL PROPERTY.				100000			
ded										District of the last						Richard Co.	
										AND DESCRIPTION OF THE PERSON NAMED IN COLUMN 1		Participation of the					
ed relded							2			2	1	1	1			1	1
										ESTATE AND	NAME AND ADDRESS OF THE				BURNING S		
			2	STEEL STEEL	MARKET SEC		7		Marie L		2	DENNISHTACK NUMBER SEES	CHILD SECTION	NAME OF TAXABLE PARTY.			2
	BOOK STREET		STATE OF THE PARTY	CONTRACTOR		Section 1				CONTRACTOR OF THE				THE PERSON	Contains	CONTRACTOR OF	
											CONTRACTOR OF SAME						
type)				THE REAL PROPERTY.	Maria de la compansión		CHARLES BOARD		DEPARTURE OF	TAX SAME	CHURCHUS COM	TO GO TO SHOW THE	PERSONAL PROPERTY.	TO THE RES	PARTIE DESIGNATION OF THE PARTIES OF	STATE OF THE STATE OF	Marines II
/ft3)^.5 lb/ft3)^.5	September 1				Park of the last	AND DESIGNATION OF THE PERSON NAMED IN COLUMN 1	1	COLUMN TO SERVICE AND SERVICE	Market Committee		CONTRACTOR DESCRIPTION		DESCRIPTION OF THE PERSON NAMED IN COLUMN 1	100000	COLOR DE	DECEMBER OF THE	Description of the
eboth)	Marie Barrier		MANUAL PROPERTY.	4		2		CALL SHOWING	NS OF STREET	2			The same of	THE PERSON NAMED IN	Secreta	2	
in						D. POINT	12/4			No.			6.000				6,000
in	0.000	0.060						NAME OF TAXABLE PARTY.	PIL SECRET	1000	03500000	Name of the last of	NO. SEEDING	and the same	Section.	Marie Sales	Shipping Shipping
R fluid	0.000	0.000										Marie Town	PROPERTY AND ADDRESS OF THE PARTY AND ADDRESS				
K factor					SERVICE			No.		No.							
Ib/hr gpm Ib/ft3	Marie Control		Marie Val								No. of Contrast		Marie Control			The same of	
cP				Manager Service	English market	REPORT OF THE	HARACON CONT.	Control of the last	See (190)			Mesans of	BENEVAL NO.				
dyne/cm lb/hr	2085	2085	4170	752	752	752	376	1993	1993	1993	1993	1993	1993	1425	1425	1425	1425
lb/ft3	29.14	29.14	29.140	29.140	29.14	29.14		29.14	29.14	29.14	29.14	29.14	29.14	29.14	29.14	29.14	29.14
F	0.994 115.0	0.994 115.0	0.994	0.994 115.0	0.994	0.994	29.14 0.994 115.0	0.994	0.994	0.994	0.994	0.994 115.0	0.994 115.0	0.994 115.0	0.994 115.0	0.994	0.994
сP	0.010	0.010	0.010	0.010	0.010	0.010	115.0 0.010	0.010	0.010	0.010	115.0 0.010	0.010	0.010	0.010	0.010	0.010	0.010

i3.5	atm flare stack and tip	Downstream of 1st Flare	Common	Hunts Along KO Outlet	1000	Hunts Along Flare Header	Fr Rw Hunts Along Vent Header	Shoots KO Outlet	KO Drum	Shoots Flare Header		Shoots T-5050 Vent Jumper	Shoots T-5560 Vant Jumper	Demaray KO Outlet	NO Drum	Demaray Flare Header	Demaray Vent Header
NT ID	G	н	1	J	K	L	M	N	0	P	Q	R	S	T	U	V	W
in	4.026	6.065	6.065	6.065	23.250	4.026	4.026	6.065	23.250	6.065	6.065	6.065	4.026	6.065	23.250	6.065	4.026
	Duk/Hugh	DukHugh	Duk/Hugh	DukHugh	Duk/Hugh	Duk/Hugh	Duk/Hugh	Duk/Hugh	Duk/Hugh	Duk/Hugh	Duk/Hugh	Duk/Hugh	DukHugh	Duk/Hugh	Duk/Hugh		Duk/Hugh
lb/hr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
gpm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ib/ft3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
cP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ne/cm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
lb/hr	2085	2085	4170	752	752	752	376	1993	1993	1993	1993	1993	1993	1425	1425	1425	1425
cP	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
psig	0.00	0.04	0.19	0.31	0.31	0.43	0.56	0.31	0.32	0.44	0.59	0.64	0.78	0.31	0.31	0.37	0.56
Ib/ft3	0.0642	0.0644	0.0651	0.0656	0.0656	0.0662	0.0668	0.0657	0.0657	0.0662	0.0870	0.0672	0.0679	0.0656	0.0657	0.0659	0.0668
1b/ft3	0.06	0.06	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
ft2	0.0884	0.2006	0 2006	0.2006	2.9483	0.0884	0.0884	0.2006	2 9483	0 2006	0.2008	0.2006	0.0884	0.2006	2.9483	0.2006	0.0884
t/sec	102.08	44.84	88.69	15.87	1.08	35.70	17.68	42.02	2.86	41.65	41.19	41.04	92.25	30.05	2.04	29.91	67.00
t/sec	394.75	394.16	391.97	390.36	390.34	388.65	386.79	390.26	390.13	388.54	386.41	385.68	383.86	390.31	390.23	389.41	386.86
cP	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
-	3.27E+05	2.17E+05	4.34E+05	7.83E+04	2.04E+04	1.18E+05	5.90E+04	2.08E+05	5.41E+04	2.08E+05	2.08E+05	2.08E+05	3.13E+05	1.48E+05	3.87E+04	1.48E+05	2.24E+05
- 11	0.0178	0.0175	0.0164	0.0202	0.0259	0.0197	0.0218	0.0176	0.0208	0.0176	0.0176	0.0176	0.0178	0.0184	0.0224	0.0184	0.0184
	0.80	1.04	3.48	0.92	0.11	24.34	7.14	0.52	0.09	14.93	2.51	0.59	1.38	0.55	0.09	15.64	3.01
- 1	0.00	0.50	0.51	0.40	0.00	0.98	5.49	0.32	0.00	2.37	3.45	0.94	1.56	0.57	0.00	1.69	3.76
- 11	0.00	0.00	0.00	0.61	0.00	1.02	0.00	0.61	0.00	1.01	0.61	0.61	0.92	0.61	0.00	1.01	0.92
- 11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.80	1.54	3.98	1.93	0.11	26.33	12.63	1.45	0.09	18.31	6.57	2.14	3.86	1.73	0.09	18.34	7.69
fluid	161.93	31.25	122.25	3.91	0.02	19.81	4.86	27.44	0.13	26.95	26.37	26.17	132.25	14,04	0.06	13.91	69.76
ft	15.0	44.3	122.6	48.3	8.0	449.1	194.6	41.6	8.0	525.0	188.4	61.3	72.5	47.5	8.0	504.3	140.5
psig	0.0000	0.0815	0.3034	0.3069	0.30685	0.54696	0.57545	0.3216	0.32160	0.54900	0.62971	0.65587	0.89848	0.3145	0.31446	0.43134	0.68136
psi	0.00	0,08	0.30	0.31	0.31	0.55	0,58	0.32	0.32	0.55	0.63	0.66	0.90	0.31	0.31	0.43	0.68
psig	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
psi	#VALUE!	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
psi	0.06	0.02	0.22	0.00	0.00	0.24	0.03	0.02	0.00	0.23	0.08	0.03	0.24	0.01	0.00	0.12	0.25
-	1.07E-02	2 06E-03	8.07E-03	2.58E-04	1.20E-06	1.31E-03	3.21E-04	1.81E-03	8.38E-06	1.78E-03	1.74E-03	1.73E-03	8.73E-03	9.27E-04	4.29E-06	9.18E-04	4.61E-03
psi	#VALUE!	0.08	0.22	0.00	0.00	0.24	0.03	0.02	0.00	0.23	0.08	0.03	0.24	0.01	0.00	0.12	0.25
psig	0.00	0.00	0.08	0.30	0.31	0.31	0.65	0.30	0.32	0.32	0.55	0.63	0.66	0.30	0.31	0.31	0.43
psig	0.0000	0.0000	0.0816	0.3034	0,3069	0.3069	0.5470	0.3034	0.3216	0.3216	0.5490	0.6297	0.6559	0.3034	0.3145	0.3145	0.4313
	OK	OK	OK	OK	OK	OK	OK	OK	OK.	OK	OK	OK	OK	OK	OK	OK	OK
M	0.103	0.046	0.091	0.016	0.001	0.036	0.018	0.043	0.003	0.043	0.042	0.042	0.094	0.030	0.002	0.030	0.068
fd]	651 651,445	651 651,445	1,302,890	235 235,040	235,040	235 235,040	118 117,520	622,630	623 622,630	623 622,630	623 622,630	623 622,630	623 622,630	445,220	445,220	445,220	445,220
4	091,440	001,440	1,302,090	230,040	230,040	230,040	117,020	022,030	022,030	022,030	022,030	022,030	022,030	443,220	443,220	440,220	440,220



Kattevold USA CTB Vent Line Design & Capacity Assessment

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Marathon Oil	(b) (6)
Tim Archuleta	ž.
Nate Mascarenas, Kendra Meeker	
July 17, 2017	\$
Kattevold USA CTB- Vent Line Design and Capacity Assessment	
	Tim Archuleta Nate Mascarenas, Kendra Meeker July 17, 2017

The US EPA finalized "Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After September 18, 2015" on June 3, 2016. This regulation has requirements for certifying the design of closed vent systems. An assessment of the closed vent must be performed to determine it is of sufficient design and capacity to ensure that all emissions from storage vessels are routed to the control device or process and have it certified by a qualified professional engineer. This regulation is 40 CFR 40 Subpart 0000a, referred to as the Quad Oa regulation.

Certification for 40 CFR 60.5411a(d):

"I certify that the closed vent system design and capacity assessment was prepared under my direction or supervision. I further certify that the closed vent system design and capacity assessment was conducted and this report was prepared pursuant to the requirements of subpart Quad Oa of 40 CFR part 60. Based on my professional knowledge and experience, and inquiry of personnel involved in the assessment, the certification submitted herein is true, accurate, and complete. I am aware that there are penalties for knowingly submitting false information."

Purpose:

Evaluate the new Kattevold USA CTB tank battery vent line design to ensure that the Enardo ES-660 thief hatches, which are set at 16 oz/in^2 , will not open during normal operating flow rate scenarios. The normal flow path for the vapor from the storage tanks will be to two flares where the off gas will be combusted to meet Quad Oa regulations.

This tank battery is comprised of two different production trains: the Kattevold USA CTB and Alexander USA single well facility with separate tank vent headers and flare knock out drums which then combine into a single flare header that flows to two flares.

Results:

Based on the 3D model (dated 7/6/17) of the vent systems and predicted vapor flow rates, Halker Consulting evaluated the pipe routing from the storage tanks to the flare and calculated the expected pressure drop in the system during the Marathon Oil specified maximum predicted vapor flow rates. The pressure at the outlet of the flare was set at local atmospheric pressure of approximately 13.5 psia. Pressure drop through the piping system from the furthest storage tank to the flare was calculated for each of the well pads with the following results:

Kattevold USA CTB: 6.3 oz/in²g

Alexander USA single well facility: 3.7 oz/in²g

A flare tip pressure drop of 0.0 oz/in² was used and was based on information provided by Steffes Flare systems for the Air Assist Model 4. The flame arrestor pressure drop used was 0.64 oz/in² and is based on the Enardo sizing program for a 6" Series 8 inline flame arrestor.

Because this tank vent system is composed of two individual production trains each having their own peak rate, two total system peak rates were evaluated corresponding to the peak rates from each individual production train. It was determined that the worst case scenario exists when the total gas flow rate was 1,022 Mscfd (3,271 lb/hr) which corresponds to the Kattevold production train peak rate. The tank gas flow rate is based on a condensate flash factor and gas composition provided by Marathon Oil. The gas composition used was the average composition from the February 2017 Clarks Creek (MM) Analysis Summary.

Using the same calculation methodology, the total gas flow rate can be increased to approximately 1,584 Mscfd and stay below the opening pressure of an Enardo ES-660 thief hatch (14.4 oz/in²). This is approximately 1.55 times the normal flow. The flow was increased by an equal factor of 55% applied to the maximum forecast tank vapor rates for each of the two trains.

Standard pressure drop "K" value for fittings and valves per Crane Technical Paper 410 were used. The value used for the absolute roughness of steel was 0.00015 ft.

*Attached are the tabulated results of the hydraulic calculations

Disclaimer:

This assessment meets the certification requirements of 40 CFR part 60 subpart 0000a. It is the responsibility of *Marathon Oil* to comply with the reporting requirements of this regulation.

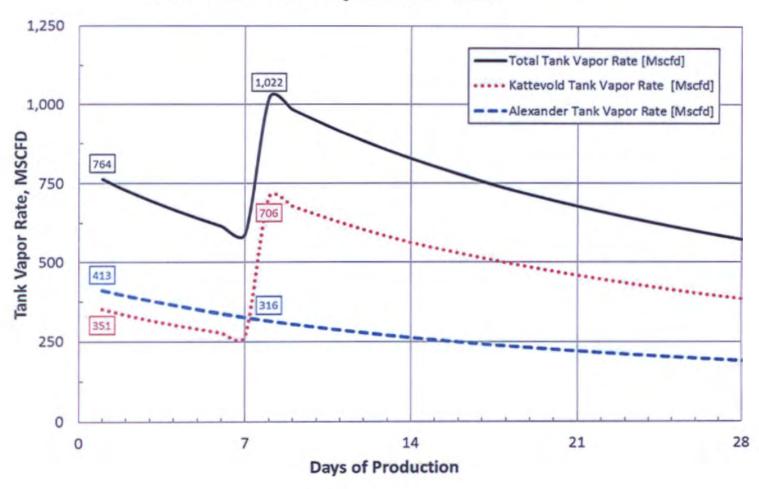
Attachment 1 - Normal Hydraulic Calculations

			Calculations				1		4 7 7					1/100	
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nit roj#		Forw Calculations	135	0.5	-	-	200	Winds.	Marie .			200	-	Selection .	
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lev/Date	ALC: NO.	12-Jul-17	SEGMENT E	6	н	1	- 3	- 8	L	M	N	0	-	0	
******		agment ID or known press. Segment ID or known press.	pro	13.50						The same of	-			DADAGE	
ata	& known pre	esure Up or Downstream (Ue	0)3	diam'	6					4		THE REAL PROPERTY.	4	4	
ric Method	(1-4-to-map 2 or	Harte-Duker 3-1, 41 4-degp 5:11 1 +Haghmark, 3-1, 46, 6-848, 5-East	nashemat				10000	STATE OF	Name of Street		20000		1000	DODGE	
tiroup Wath	Fige Rough	1859	an)	0,00015	0.00015	0.00016	0.00016	0.00015	0.00015	0.00015	0.00048	0.00015	0.00016	omes	
Ppr	Naminal Line	Size or Internal Chamater	inches	4,000	6.000	6.000	6,000	24.00	8,000	8,000	8,000	24.000	6.000	4.000	
	Streight pipe	0, std, etc.) Blank #1D. given a length	DOYA	20.0	70.0	77.0	#M #0.0	40	210.5	NI.	100	4.0	200.0	886	
No.	Straight pipe triet & Outer		-	and the last				Honey.	No. of Lot				E-STATE OF		
den	Ofference	(Outlet - Inlet) Ofference	1000	9.0	0.0	00	0.0	- 00	0.0	80	68	8.5	65	0.0	
	Offerwore 90's	5td (R:O=1), 8veaded						- 00	RELIGIO	Contract to	Name of Street	THE R.	1200	Charles St.	
K Netrod	971	Short Radius (R/D+1), fig0h Standard (R/D+1 S), all tippe	mosd.	-	-		2	-		2	2		1		
		Standard (RID=1 S), all tope 1 weld (R	dug angle	MINISTER !					DEC STATE	The same of		PERSONAL PROPERTY.			
		Swell (X	deg angle deg angle	-	-					10000				1	
	Choose type	Plug Valve Branch Fibre		1000					C DECIMAL STATE	Name and Address of the Owner, where	No. of Lot		Topics:		
	570000 hos	Plug Valve Straight Thru Short Radius (RIO-1), all to	100						-	-					
bows	471	Short Radius (RIO-1), all to Standard (RIO-1 S), all type Mitered, 1 weld, 45 deg angle							A STATE OF	The state of	No. of Lot	Witness.	The same	-	
		Mered 2 weld, 22.5 deg and				-			100000		-				
	Choose trop	Mered 2 web, 22.5 deg ary Bull Valve Full Port Close Return (R/O+1), Bress	-			Distance of the last				and the last		-			
	1903	Close Return (RID+1), fools	rekted		-		The State of			THE STATE OF	-	No.		-	
	180	Close Return (RID+1), footh Standard (RID+1,5), all type Standard (RID+1), three-led		Description of the last of the		LICE SERVICE S	-	-	MCC294	O ELICAN	-		The same of		
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ees	Flow	Stub-in type branch Threaded				Charles on	The state of	NAME OF TAXABLE PARTY.	The same of	To the same	U.S.	1000		Total Control	
	tvu	Flanged or Welded			PER COST		STATE STATE OF	Statement of the last	COURS (COURS	2		100	District Name of Street, or other Designation of the least name of	The State	
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	Clate, Ball or Plug	Reduced tim, Batan0.9		2000	and the same	No.	1000	talo fauts	RESTAURANT .				-		
	Giote, stand	Reduced tim, Betar0.6													
blves	Globe - (Ang	le or Y-type) or Disphragm (da	m (ype)		No. of Lot	Name and Post	NAME OF TAXABLE PARTY.	Marine Li	No.	No in case	A COLUMN TWO			No. of Lot	
	Butterfly	Lift - min val (Ris)+ Military	- NAMES OF		2000		TO LOS		10000			NEW COLUMN	A. Carrier		
	Check	Swing - min vel (5%)= 40(a)		-	Section 2			- CLIN				No. of Lot		1	
	Pro Estrato	Titing-disk re-Exthiphrope Heat , 24ed	Total Control										Name and Address of the Owner, where		
	Swage to Do	ameter (at end)	The Party of the P		Total Control										
Other OP	Orlfoe Diam	eter ton Demeter	-						A PROPERTY.	100000		-			
	Other Fress	ure Drop (Equip. etc.)	270	8.868	8.565										
	Other Head I	Pressure Drop (Equip. etc.)	11/0	APPENDING FOR			-	1000	The Real Property lies	100000					
	Miscellaneou	on-fashing liquid only?) is Flow Resistance	gon par S	The same of											
Ap All	Flow (provide	mass OR volume basis)	taly.					-			Green				
April	Density		670		THE REAL PROPERTY.			100				-			
	Veccesty Surface Texas	nine (Zerbana mile)	¢P.				DOTAL STREET	COCO		1000000	-		Parties and Partie	E PROCESSO	
	Flow Rate	eion (Zphase pris) ew. za 1 Denety	B/V B/G	1,635	1.60	3.271	2.290	7.29	2.29	3,130	1.011	1.011	1.011	624	
Лирог	General Own	W. ZAT Carety_	673	200.44	90.14	Control of the last	THE REAL PROPERTY.	200.00	200	2014	-	70.14	AND DESCRIPTION OF THE PERSON	Printers and the last	
age.		Z	_	0.994	29.14 0.994 115.0	0 (64 115.0	0.004 110.0	0.004	C.REA	0.004	0.004	0.004	Obel	29.14 0.994 115.0	
	Vana Vana	Temp	F	115.0	115.0	115.0	9100	115.0	115.0	1150	118.9	118.0	115.0	1150	
pe interne	Waper Viscos Diameter Calculation M	19	10	4.026	6.065	6.065	8.065	23 280	6 065	6 096	6.066	23 20	6.065	6.065	
P / Holdup	Calculation M	lethods .		Dukhtugh	DUNHugh	DUMHligh	DURTHUGH	Dukfrligh	DukHigh	Dukflagh	DUAFFLIER	DUNFLOR	Diantign	Dukitsugh	
	Flow rate Flow rate		Str.	00	00	00	0.0	0.0	00	00	60	0.0	00	0.0	
Dags	Density		BACO.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Viscosity Surface Terr	sion (2 phase pray)	dnelon	0.00	0.00	0.00	0.00	0.00	0.00 0.00	0.00	0.00	0.00	0.00	0.00	
		sion (2 shase sris)	Mr.	1636	1605	0.00 3271	2299 2299	2259 2259	2259	1130	1011	1011	1011	674	
Marce	Segment Au	oty orage Pressure	pay	0.010	0.010	0.010	0.18	0.010	0.010	0.010	0.010	0.17	0.19	0.22	
	Vapor Densit	ty (Avg)	BAG.	0.0642	0.0643	0.0647	0.0650	0.0681	0.0685	0.0000	0.0649	0.0660	0.0651	0.0952	
	Bulk Dersety	(Aug)	BPD	0.06	0.06	0.06	9.07	0.07	0.07	0.07	0.06	0.06	10.0	0.07	
low	Pipe Flow Ar Bulk Velocity		Name of Street	80 07	0.2006 35.20	0.2006 69.99	6 2006 46 11	3.27	0.2006 47.75	0.2006 29.71	0.2006 21.56	1.47	0.2006 21.51	0.2006	
	Erosienel Ve	looily if solids present	Name	394.75	394 28	263.13	392.17	391.69	390 71	389.32	392 41	392.35	391 98	391.52	
	Average Visc Elevation Chi	oneity ange (Outlet-Inlet)	EP	0.010	0010	000	0010	0.010	0.010	0010	0010	0010	0.010	0010	
22-		imber (NRe)		2.57E+05	6.70E+05	3.41E+05	2.35E+05	614E+04	2.356+05	1.18E+05	1.056+06	2.75E+04	1 05E+05	7.02E=04	
	Raynolds Nu	or f. (Coletrook & White)		0.0181	2.50	2.39	1 05	0.0203	7 22	2.97	0.0193	0.0242	0 0193	2.57	
	Raynolds Nu Friction Fact	ne)			0.30	0.33	0.81	0.00	1.90	4.41	1.26	0.00	2.95	4.27	
	Raynolds No. Friction Fact K (straight pi K (Stings +)	pe) valves) 4		0.00		0.00	0.61	0.00	1.01	0.61	0.61	0.00	1.02	0.61	
who	Raynolds Nu Fraction Fact K (straight pi K (Stings * v K (entrance	pe) vshes) * exit + exages + orifice)	C-1	0.00	0.00	0.00	0.00								1
who	Reynolds Nu Friction Fact K (athought pi K (fittings + v K (entrance K (Miscettany Total K	ce) rahes) • exit + exages + orfice) sous Flow Resistance + Valve		0.00	0.00	0.00	2.45						16.19		
who	Reynolds Nu Friction Fact K (straight pi K (fittings = v K (entrance K (Miscettary Total K Uslooty Hea	pe) rahes) * exit + enisges + orfice) sous Flow Resistance + Valve d (Average Density Basis)	Cv)	0.00 0.00 1.06 99.63	0 00 0 00 2 69	0.00 2.72 76.12	2.45 36.97	0.04	10.23	7.98 8.73	732	005	719	7.45	
utes	Reynolds Nu Fraction Fact K (streight or K (fittings = s K (entrance K (Mocettane Total K Velocity Hea Equivalent le Uoctean Pr	pe) white) + exit + exages + orfice) boxs Flow Resistance + Valve d (Average Density Basis) path costure before CV		0.00 0.00 1.06	0:00 0:00 2:69	0.00									6.3 gaig 5
retera	Reynolds Nu Fraction Fact K (straight p K (fittings + v K (entrance K (Miscettary Total K Usicoty hea Equivalent le Upstream Pr Austable Ups	pe) valves) + exit + exispes + orifice) + exit + exispes + orifice) cous Flow Resistance + Valve d (Average Density Basis) costs costure before CV esteam Control Valve DP	t hud h prig prig	0.00 0.00 1.06 99.63 20.0	0:00 0:00 2:59 19:25 61:0	0.00 2.72 76.12 62.1	245 20.97 71.2 0.3	0 04 0 17 4 0 6.2	10 23 35 44 297 4 6.4	7.98 8.73 212.5 0.4	7 224 7 22 58 8	003	718 6238	7.45 3.18 182.6	8.3 osig 5
riction	Risynolds Nu Friction Facility K (straight pi K (straight or K (straight or K (straight or K (straight or Velooity Hea- Eautaled to Upsteam Pr Auslable Ups Segment Up Segment Up Static Head	oe) * exit + exages + arifice) pour Flow Resistance + Volue d (Avarage Density Basis) (XID) existing before CV wheam Control Value DP wheam pressure Pressure Drop	# fluid (Mig. (Mig. (Mig.	0.00 0.00 1.06 99.63 20.0 0.6	0:00 0:00 2:59 19:25 61:0 0.1	0.00 2.72 76.12 82.1 0.34	2.45 30.97 71.2 0.3	0.04 0.17 4.0 6.2	10 23 36 44 297 4 6.4	7.68 8.73 212.5 0.4 0.40	7 22 7 22 58 8 8.1	0.05 0.03 4.0 8.17	96.18 7.19 623.8 83 6.23	7.45 3.18 182.6 0.21	f.3 only 5
riction	Reynolds Nu Fiscion Facility K (straight of K (straight of K (straight of K (Mocetan Total K Velooity Nea Equivalent to Upstrain Upstrain Available Up Segment Up Static Head Other Press	oe) solves) * exit * energes * orifice) gous From Resistance * visive # (Average Density Basis) politics before CV stream pressure Pressure Drop # Drop (Equ. to Allow)	# flux frig prig prig prig prig	0.00 0.00 1.06 99.63 20.0 0.0 0.00 #WALLE	0:00 0:00 2:59 19:25 61:0 0.1 0.0 0:00 0:04	0.00 2.72 76 12 82.1 6.16 0.00 0.00	2.45 26.97 71.2 9.3 0.20 0.00 0.00	0.04 0.17 4.0 8.3 0.20 0.00 0.00	10 23 35 44 297 4 6.36 0.00 0.00	7.98 8.73 212.5 0.4 8.48 0.00 0.00	2 24 7 22 58 8 8 1 9.17 0.00 0.00	0.05 0.03 4.0 8.1 0.17 0.00 0.00	93.19 7.19 423.6 8.2 0.00 0.00	7.45 3.18 182.6 0.2 0.23 0.00 0.00	f.3 osig A
friction	Reprode No. Fraction Fact K (atmight pl K (fittings +) K (enthance K (who et al.) Total K Unicoty Hea Eachgled to Upsteam Pr Assisted Up Static Head Other Press Friction Pres	oe) **axin = exages * artifice) **axin = exages * artifice) double flow Resistance * Valve di (Average Deneity Basis) OSB. exacte before CV extern Deneity Valve DP extern pressure Pressure Dressure pressure Dress	# fluid (5%) (5%) (5%) (5%) (5%)	0.00 0.00 1.06 99.63 20.0 0.6 0.00 #/ALLE:	0:00 0:00 2:59 19:25 61:0 0:1 0:00 0:00 0:04 0:02	0.00 2.72 76 12 82.1 8.1 6.16 0.00 0.00 0.00	2.45 26.97 71.2 8.3 0.30 0.00 0.00 0.04	0.04 0.17 4.0 8.3 0.20 0.00 0.00 0.00	10 23 35 44 297 4 8.4 6.36 0.00 0.00 0.16	7.98 8.73 212.5 0.4 6.40 0.00 0.00 0.00	2.24 7.22 58.6 8.1 9.17 0.00 0.00 0.00	0.05 0.03 4.0 8.1 9.17 0.00 0.00 0.00	16.19 7 19 423.6 6.22 0.00 0.00 0.00	7.45 3.18 182.6 0.2 0.00 0.00 0.00	8.3 only 3
riction	Raynolds Nu. Fraction Fact K (straight pi K (fatings +) K (entrained K (Mocetary Total K Velooity Hea Eauhaland le Ups beam Pi Available Ups Segment Up Safe Head Other Presss Friction Pres Accaleration Total System	cel ** axit = enages = erifice) cour Fron Resistance = Value If (Nearage Censity Basis) (XII) ** axit = enage Censity Basis) (XIII) ** axit = enage Censity Basis) (XIII) ** axit = enage Censity Basis) ** axit = enage Censity Basis ** axit = enages Censi	\$ 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	0.00 0.00 1.08 99.63 20.0 8.8 6.60 0.00 F/ALUE! 0.06 6.60E-03	0:00 0:00 2:59 19:25 61:0 6.1 6.06 0:00 0:04 0:02 1.27E-03 0:08	0.00 2.72 76 12 82.1 8.14 0.00 0.00 0.00 0.00 0.00 5.03E-03 5.08	2.45 26.97 71.2 0.3 0.20 0.00 0.00 0.04 2.37E-0.3 0.04	0.04 0.17 4.0 8.3 0.20 0.00 0.00 0.00 0.00 0.00 0.00	10.23 36.44 267.4 8.4 0.00 0.00 0.16 2.34E-0.3 0.17	7.98 8.73 212.5 0.4 0.40 0.00 0.00 0.00 0.03 5.77E-04 0.03	2.24 7.22 58.8 0.17 0.00 0.00 0.01 4.77E-04	0.05 0.03 4.0 8.1 0.17 0.00 0.00 0.00 2.216-06 0.00	16.19 7.19 423.6 8.2 0.00 0.00 0.05 4.75E-04 0.05	7.45 3.18 182.6 0.2 0.00 0.00 0.00 0.01 2.10E-04 0.01	8.3 osig 3
riction	Reynolds Nu. Fraction Facility (18 control of the	04) **axi **avages **artice) **axi **avages **artice) **axi **avages **artice) **axi **avages Density Basis) 08D. **avages Density Basis) **avages Density Basis) **avages Density Valve DP **avages Density Valve DP **avages Density	\$ 5.45 (5.40	0.00 1.08 99.63 20.0 0.8 6.60 0.00 #/ALLE: 0.06 6.50E-03	0:00 0:00 2:99 19:25 61:0 0:1 0:00 0:04 0:02 1:27E-03	0.00 2.72 76 12 82 1 8.14 0.00 0.00 0.00 5.03E.03	2.45 26.97 71.2 8.3 0.20 0.00 0.00 0.04 2.37E-03	0.04 0.17 4.0 6.3 6.26 0.00 0.00 0.00 0.00 0.00 0.00	10 23 35 44 297 A 6.4 6.36 0.00 0.00 0.16 2.34E-03	7.98 8.73 212.5 0.4 0.00 0.00 0.00 0.03 5.77E-04	2.24 7.22 58.6 8.1 0.17 0.00 0.00 0.00 4.77E-04	0.05 0.03 4.0 8.1 0.17 0.00 0.00 0.00 0.00 2.216-06	98.19 7 19 423.8 8.22 0.00 0.00 0.00 4.75E-04	7.45 3.18 182.6 0.3 0.00 0.00 0.00 0.01 2.10E-04	5.3 only 3.
riction	Risprekte Nu. Fraction Each K (straight pi K (fibrigs + v K (entrance K (straight pi K (fibrigs + v K (entrance K (straight) (straight	orl) **axi = sinages = artice) **axi = sinage Density Basis) **pass **passare Density Basis) **passare Density = Density Basis **pressure Density =	\$ 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	0.00 0.00 1.08 99.63 20.0 8.8 6.60 0.00 F/ALUE! 0.06 6.60E-03	0:00 0:00 2:59 19:25 61:0 6.1 6.06 0:00 0:04 0:02 1.27E-03 0:08	0.00 2.72 76 12 82.1 8.14 0.00 0.00 0.00 0.00 0.00 5.03E-03 5.08	2.45 26.97 71.2 0.3 0.20 0.00 0.00 0.04 2.37E-0.3 0.04	0.04 0.17 4.0 8.3 0.20 0.00 0.00 0.00 0.00 0.00 0.00	10.23 36.44 267.4 8.4 0.00 0.00 0.16 2.34E-0.3 0.17	7.98 8.73 212.5 0.4 0.40 0.00 0.00 0.00 0.03 5.77E-04 0.03	2.24 7.22 58.8 0.17 0.00 0.00 0.01 4.77E-04	0.05 0.03 4.0 8.1 0.17 0.00 0.00 0.00 2.216-06 0.00	16.19 7.19 423.6 8.2 0.00 0.00 0.05 4.75E-04 0.05	7.45 3.18 182.6 0.2 0.00 0.00 0.00 0.01 2.10E-04 0.01	5.3 gelg 3.

Attachment 2 - Normal Tank Vapor Forecast

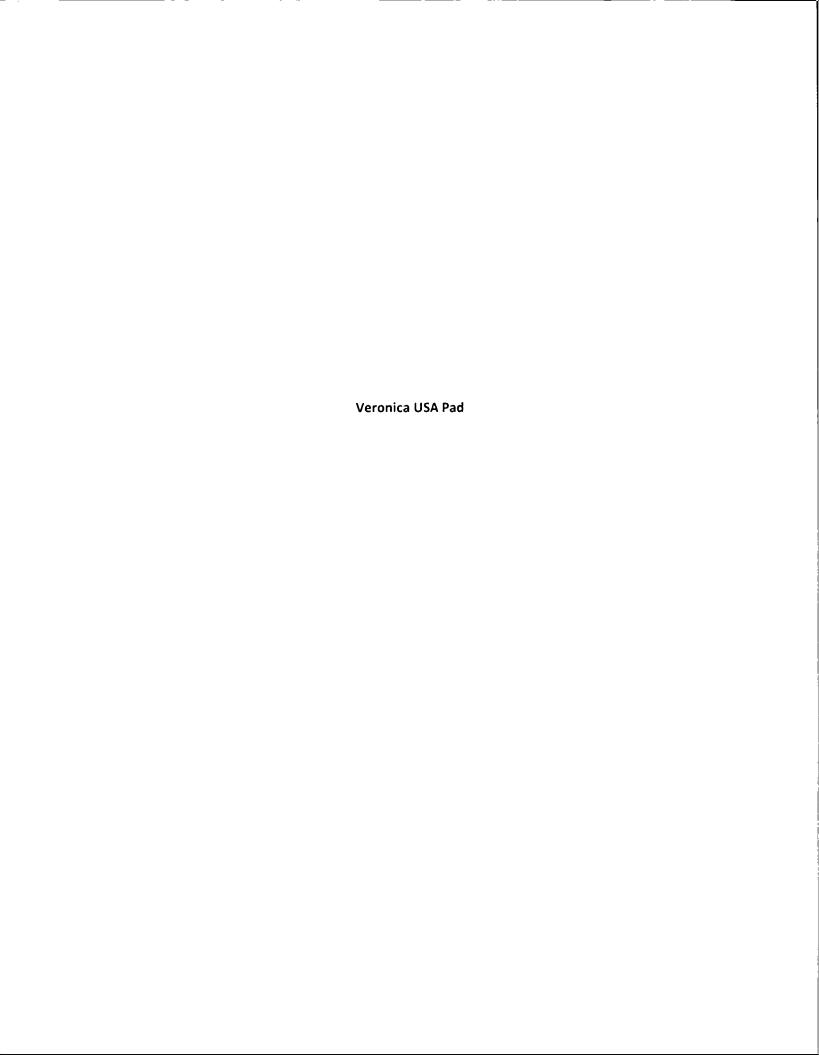
MARATHON Tank Vent Forecast

Normal Flow Scenario 1: Kattevold USA 44-33TFH begins flowback with Alexander USA 44-33TFH. Pfundheller USA 44-33H begins flowback one week later.



Attachment 3 - Maximum Rated Capacity Hydraulic Calculations

			Calculations	1		1000	10000				100	-	135		
lient.	Marathon De		Bosis /			- 111								2000	
ojest caton	Kate-old CT		Notes			1333									
it ge	TVCS Maxim	Jim Piou Calculations	13.5	-	64	-	and the same	-	The sale	200	Since.	-	-	600	
MCHER	16039-17	Pres Un		See to	fet face	CINS commission	Nati NO Outlet	Drum	Katt Flare Header	Kett Vent Header	Plex ND Dubet	Ass KD Drum	Avet Flare Freeder	Pleaser	Rat.
v/Date	No. of Concession, Name of Street, or other Designation, Name of Street, Name	12-Jul-17 S	EGNENT IO	0	H	1	1	K	L	м	N	0	-	0	
ssure		egment ID or known press Segment ID or known pres		13,50	-					L		N.	-	-	
ta	is known pro	essure Up or Donnatiesm (I	U or Dj7	8		4	- 0	- 6	4	8	0		4	4	
Method	districted and	ren-Curar Int. o. 6-Beggi 8-1 fr- 2 mkghmari, 3-L-M,4-B&B,5-E	settema)	Black Co.		10000		Married							
orde water	Pripe Rough	ness	- A	0.00015	6.50015	8,00015	0.00018	0.00015	0.00015	8 000015	6.00015	8 58616	8 58015	0.00015	
	Nominal Lin Schedule (4	e Size or internal Diameter 0, std. etc.) Blank (FLD. given	Inches	4,500	6300	6.000	6 600	24 000	6.000	6 000	6 000	24,500	6,000	6.800	
	Straight pipe mar & Oude	length		9/d 20.0	70.0	72.0	30.0	4.0	210 B	79.0	10.0	4.0	1200	63.0	
N-	OR	Outlet	-												
	Oifference 90's	(Outlet-Inlet) Outlet		0.0	0.0	0.0	90	62	0.0	0.0	0.0	0.0	00	0.0	
		BRANCH CONTRACT BAR	helded		1000			-					200		
Method	90's	Standard (R/D=1,5), all type I weld (R/D=1,5)	Adea angle)	1000	1				100	2			Name and		
		Meisting 2 weig (4)	o deg angle) [Aller Street	The same of	
	Choose Mod												DESCRIPTION OF		
	Choose type	Pug Valve Branch Flow Pug Valve Straight Thru Short Radius (R/O=1), all ty	1	Service of the last										Contraction of the last	
ows *	45% 45%	Short Radius (R/O=1), all ty Standard (R/O=1.5), all type	pes		-				TOTAL STREET						
		Mitered 1 weld 45 dep and	sia .			-	A STATE OF		Land of the land				No.	Lacore	
	Choose type	Mared 2 weld 22 5 deg a Ball Valve Full Port	nge .					-							
		Cities Return (RID+1), Pire.	eded		Name and Address of the Owner, where the Owner, which is the Own	SECTION 1		Contract of the Contract of th				-		The second	
	160%	Close Return (R.D+1), figd Standard (R.D+1.5), all type	16		The same									ALC: UNITED BY	
	Used	Standard (R/D×1), Breader Long-radius (R/D×1.5), Bve	d		DE EPHONE		THE REAL PROPERTY.	-						Lane of the lane o	
	an .	Standard (R/D=1), flanged	or welded		And the second	SECTION AND DESCRIPTION AND DE	No. of Lot	100000	Marie Land	2	30120		2	2	
16	Flow-	Stub-in type branch Threaded					Contract of the last of the la		Control of the last				NEW SAIL	ALCOHOL: N	
	thru	Flanged or Welded	- 1			2	STATE OF THE OWNER.	-	BERN LINE	2	4	100.6		100	
_	Tes	Stub-in tipe branch Full line size, Beta+1.0	_				Contract of the last			- 4			ACCRECATE VALUE OF		
	Gets. Balt or Plug	Reduced trim, Beta=0.9				1000		-		Total Control					
	Globe, stand	Reduced trim, Bets 40 8 and							Control of the						
105	Globe - (Ang	is or Y-type) or Disphragm (dem type). *							NO OIL			10000		
	Buterfy	Lift - min vel (Na)= 35 (dur	ta (6/63)*5					-							
	Check	Swing - min vel (f/s)= 40/to	tens (b/ft3)*.5							100				ALCOHOL: N	
	Pipe Entranc	Tilang-disk eEst7(0=none,1=entr, 2=e	et,3-both)						1		1		7	Partie State	
her	Swage to Diam Onfice Diam	ameter (at end)	in in		4 800								DECKU		
1	Inital Swage	tag Diameter	-				1		-		The second				
	Other Prese	ure Drop (Equip, etc.) Pressure Drop (Equip, etc.)	8 fund gowyan 5	0.000	0.064		The second		ACCRECATE OF THE PARTY.				No.		
	Value Cv (No	in-flashing liquid only?)	gompe^5									COLUMN 1	1 COPA	100000	
_		us Flow Resistence e mass Offvolume basis)	K factor										1000000		
uld	Danaity	7,000	gom ISR3	Charles of the last of the las				100000				April 10	-		
	Viscosity		cP		in the Land		THE REAL PROPERTY.			Notice Labor		Access to the	Control Control	THE PERSON NAMED IN	
_	Surface Yen Flow Rate	sion (2 phase only)	dynetm	2,535	2,535	8,060	3.902	3,502	1,502	1,751	1,567	1,567	1,587	1,045	
	Density OR a	McZaT Density	15/63	THE RESERVE		THE R. LEWIS CO., LANSING	2002	3/302		ETPO INTERNATIO	ECONOMIC SOCIETY.	1,001	100	No. of Concession, Name of Street, or other Designation, Name of Street, or other Designation, Name of Street, Online of	
por		Z		20.14	0.846	26 14 0.986	29.14 0.986	29 14 0 588	29.14	29.14	29.14	29.14	29.14 6 966	29 14	1 1
	Marri Marria	Temp	F	115.0	0 84E 11510	115.0	0 MAG 1950	115.0	115.0	1150	115.0	1150	115.0	115.0	1 1
4 Interne	Wepor Vision al Diameter		(a)	4 026	6.065	6.005	6,065	23 250	6 065	6.065	6.565	23 250	6 565	6 565	1
/Holdus	Plow rate	Methods	lohr	DUNHUGH	DUATHUSA	DURNHUSA	DukHush	DukHugh	DukHugh	DukHugh	DukiHugh	DUNHUSH	DUMHugh	DUXHugh	1
	Flow rate		gpn gpn	0.0	0.0	0.0	0.0	00	0.0	0.0	0.0	0.0	00	00	1 1
puid	Density Vectority		8/63	0.00	0.00	0.00	000	0.00	0.00	0.00	000	000	0.00	0.00	
	Surface Ten	sion (2 phase only)	dynaftm	0 00 2535	0.00 2535	9 00	9502	0.00	0.00	0.00	0.00	0.00	0.00	0.00 1545	
por	Flow Rate Vapor Vacor	alty	lb/r	2535	2535	0.009	9.009	3502 0.009	3502	0.009	1567	1587	1567	0,009	1
	Segment Av	erage Pressure	peig	0.00	0.07	0.26	0.41	0.45	0.64	0.86	0.37	0.38	0.44	051	
_	Vapor Densi		IbA3	0.0647	0.0650	0.0659	0.0006	0.0659	0.0677	0.0688	0.0665	0.0665	0.0666	0.0671	1
	Bulk Density Pipe Flow Ar		12	0.0884	0.07	0.07	0.07	2 9483	0.07	0.07	0.97	0.07 2.9483	0.07	0.07	1 1
W W	Bulk Wilcolly		55.60	123.13	53.96	106 50	72.76	4.94	71.57	35.23	32.66	2.22	32.50	21.56	1 1
18-	Average Visc	locity if solids present	fitted 6	0.009	392 12 0.009	389 53 0 009	367.38 0.009	386.74 0.009	384.20 0.009	381.23 0.009	387.90 0.009	387.78 0.009	366 97	386.00	1 1
	Elevation Ch.	ange (Outer-inter) umber (NRe)		9.0 4.47E+05	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1 1
	Priction Fact	orf (Colebrook & White)	0	0.0174	2.97E+05 0.0170	5 93E+05 0.0161	4 10E+05 0 0 165	1.07E+05 0.0182	4.10E+05 0.0165	2.05E+05 0.0177	1 83E+05 0 0179	478E+04 0.0214	1.83E+05 0.0179	1.22E+09 0.0189	
-	K (staight p	(94)		9.00	0.0170 2.35 0.39	0.33	0.0165 0.66 0.60	0 0182 0 04 0 00	6.85	276	0.35	0.04	11.32	2.35	1
	M. Ottomore, & o	· edt + sugges + onfeet	- 70	9.00	0.43	0.00	0.61	0.00	1.98	061	125	000	101	0.01	
	K (fittings + s K (entrance)			0.00	3.17	0.00	0.00	0.00	9.65	0.00 7.75	0.00	0.00	0.00	0.00	
	K (fittings + s K (antiunce K (Macellan	eous Flow Resistance + Val	He CVI	1.04		2.62 176.26	2.39 82.28	0.36	79.51	19 29	2.21 16.57	0.04 0.08	15.27	7.20	1 1
	K (fittings + v K (entrance K (Miscellan Total K Velocity Hea	eous Flow Resistance + Val d (Average Density Basis)	# fluid	1.04 235.63	45 25				301.8		62.5				
	K (fittings + v K (entrance K (Miscellan Total K Velocity Hea Equivalent le	eous Flow Resistance + Val d (Average Density Basis) ingth	# Nuid	235.63	45 25	82.5	73.2	4.0	301.8	222.0	62.0	40	431.5	192.7	
	K (fitings + v K (entrance K (Mscellan Total K ** Velocity Hea Equivalent le Upstream P Available Up	eous Flow Resistance + Val d (Average Density Basis) ingth ressure before CV steam Control Valve DP	# Kuid 6 peig	235.63 20.0 8.0	45 25 64 4 0.1	0.4	73.2 8.8	0.8	0.8	0.9	0.4	6.4	0.5	8.5	ien ond a
ction	K (fitings + v K (entrance K (Miscellan Total K Volocity Heas Equivalent le Upstream P Available Up Segment Up Segment Up	eous Flow Resistance + Val d (Average Density Basis) ingth ressure before CV stream pressure	Pfield E Pfig pe per perg	235 63 20 0 8.0 0.00	45 25 94 4 0.1 0.15	82.5 0.4 0.36	73.2 8.8 0.45	0.8	0.83	0.90	0.38	0.38	0.50	0.52	crade
ction	K (fitings + v K (entrance K (Mscellan Total K 1 Velocity Hea Equivalent le Upstream P Available Upstream P Segment Upstre Head Other Press	abus Flow Resistance + Val d (Average Density Basis) lingth ressure before CV stream Control Valve DP istream pressure Pressure Drop ure Drop (Cour & Allow)	P fluid E Deligi pa- paig pa-	235.63 20.0 8.0	45 25 94 4 0.1 0.18 0.00 0.08	0.4	73.2 6.8	0.8	0.8	0.0	0.4	0.4	0.5	0.5	erage
ction	K (fittings + v. K (entrance + K (Mscellan Total K Velocity Hea Equivalent is Upstream P. Austable Up Segment Up Static Head Other Press Friction Press	eous Flow Resistance + Val d (Average Density Basis) ingth ressure before CV steam Control Valve OP steam pressure Pressure Drop ure Drop (Equip & Allow) isure Drop isure Drop	Pfield E Pfig pe per perg	235.63 20.0 8.0 0.00 0.00 FVALUE:	85 25 84 4 8.1 9.15 9.00 9.08 9.06	825 9.4 9.36 9.00 9.00 9.00 9.21	73.2 8.8 0.45 0.00 0.00 0.00	0.45 0.00 0.00 0.00	0.83 0.00 0.00 0.00 0.37	8.90 0.00 0.00 0.00 0.07	0.38 0.00 0.00 0.00	8.38 0.00 0.00 0.00	8.50 0.00 0.00 0.12	0.52 0.00 0.00 0.02	Lange
	K (fitings +) K (entance K (Mocellan Total K ** Velocity Hea Equivalent is Superior Upstream Paratable Up Segment Up Seg	eous Flow Resistance + Val d (Average Density Basis) hogh ressure before CV steam Control Varve DP atteam pressure Pressure Drop ure Drop (Equip & Allow) sure Drop Factor Pressure Drop	t fuid t peig pei peig peig peige	235.63 20.0 0.0 0.00 0.00 FVALUE: 0.11 1.57E-02 FVALUE:	45 25 64 4 6.1 0.18 0.00 0.08 0.06 3.01E-03 0.15	82 5 0.4 0.36 0.00 0.00 0.21 1.17E-02 0.21	73.2 0.8 0.45 0.00 0.00 0.00 0.00 5.47E-03	0.45 0.00 0.00 0.00 2.52E-05 0.00	0.83 0.00 0.00 0.37 5.30E-03 0.37	0.90 0.00 0.00 0.07 128E-03 0.07	0.38 0.00 0.00 0.02 1.10E-03 0.02	0.4 0.38 0.00 0.00 0.00 5.10E-06 0.00	8.50 0.00 0.00 0.12 1.09E-03 0.12	6.52 0.00 0.00 0.00 0.02 4.81E-04 0.02	143 on uj 8
ction	K (fitings +) K (entaince +) K (Miscellan Total K Velocity Hea Equivalent is Upstream Phanalable Up Segment Up Static Head Other Press Friction Pres Acceleration Total System	aous Flow Resistance + Val d (Average Censity Basis) ingth ressure before CV stream Control Wive DP stream pressure Pressure Drop was Drop Factor Pressure Orop windteem Pressure CV windteem Pressure CV	t fluid t geng per peng pen pen pen pen pen pen pen pen	235.63 20.0 0.0 0.00 0.00 FULLUE: 0.11 1.57E-02	85 25 64 4 8.1 9.15 9.00 9.06 9.06 9.06 3.01E-03	9.4 9.36 9.00 9.00 9.21 1.17E-02	0.45 0.00 0.00 0.00 0.00 5.47E-03	0.45 0.00 0.00 0.00 2.52E-05	0.83 0.00 0.00 0.37 5.30E-03	8.90 0.00 0.00 0.07 1.26E-03	0.38 0.00 0.00 0.02 1.10E-03	8.4 9.38 9.00 9.00 9.00 5.10E-06	0.5 0.00 0.00 0.00 0.12 1.09E-03	0.52 0.00 0.00 0.02 4.81E-04	
thon	K (fitnigs +) K (snitsrice K (fitnigs +) K (fitnigs +) Velloolly Hea Equivalent le Upstram Pi Austable Up Staft: Head Other Press Fridton Press Fridton Press Segment Up Acealeration Total System Segment Do Austable Do	aous Piow Resistance + Val d (Average Censity Basis) ingth ressure before CV stream Control Valve DP stream pressure Pressure Drop Factor Pressure Drop Pressure Drop Winsteam Control Valve DP er Control Valve DP er Control Valve DP	E fluid E E E E E E E E E E E E E E E E E E E	235.63 20.0 0.0 0.00 0.00 FVALUE: 0.11 1.57E-02 FVALUE:	45 25 64 4 6.1 0.18 0.00 0.08 0.06 3.01E-03 0.15	82 5 0.4 0.36 0.00 0.00 0.21 1.17E-02 0.21	73.2 0.8 0.45 0.00 0.00 0.00 0.00 5.47E-03	0.45 0.00 0.00 0.00 2.52E-05 0.00	0.83 0.00 0.00 0.00 0.37 5.30E-0.3 0.37 0.45	0.90 0.00 0.00 0.07 126E-03 0.07 6.83	0.38 0.00 0.00 0.02 1.10E-03 0.02	0.4 0.38 0.00 0.00 0.00 5.10E-06 0.00	8.50 0.00 0.00 0.12 1.09E-03 0.12	6.52 0.00 0.00 0.00 0.02 4.81E-04 0.02	





LENA FACILITY TANK BATTERY VENT LINE DESIGN AND CAPACITY ASSESSMENT

TO:	Marathon Oil	(b) (6)
FROM:	Tim Archuleta	
CC:	Nate Mascarenas, Kendra Meeker	
DATE:	July 19, 2017	-
RE:	Lena Facility- Vent Line Design and Capacity Assessment	
		allilling

The US EPA finalized "Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After September 18, 2015" on June 3, 2016. This regulation has requirements for certifying the design of closed vent systems. An assessment of the closed vent must be performed to determine it is of sufficient design and capacity to ensure that all emissions from storage vessels are routed to the control device or process and have it certified by a qualified professional engineer. This regulation is 40 CFR 40 Subpart 0000a, referred to as the Quad Oa regulation.

Certification for 40 CFR 60.5411a(d):

"I certify that the closed vent system design and capacity assessment was prepared under my direction or supervision. I further certify that the closed vent system design and capacity assessment was conducted and this report was prepared pursuant to the requirements of subpart Quad Oa of 40 CFR part 60. Based on my professional knowledge and experience, and inquiry of personnel involved in the assessment, the certification submitted herein is true, accurate, and complete. I am aware that there are penalties for knowingly submitting false information."

Purpose:

Evaluate the new Lena facility tank battery vent line design to ensure that the Enardo ES-660 thief hatches, which are set at 16 oz/in² will not open during normal operating flow rate scenarios. The normal flow path for the vapor from the storage tanks will be to one flare where the off gas will be combusted to meet Quad Oa regulations.

Results:

Based on the 3D piping model (dated 6/13/17) of the vent system and predicted vapor flow rates, Halker Consulting evaluated the pipe routing from the storage tanks to the flare and calculated the expected pressure drop in the system during the Marathon Oil specified maximum predicted vapor flow rates. The pressure at the outlet of the flare was set at local atmospheric pressure of approximately 13.46 psia. Pressure drop through the piping system from the furthest storage tank to the flare was calculated and found to have a backpressure on the tank battery of 0.49 psig (7.8 oz/in²g).

During normal operating conditions the $7.8 \text{ oz/in}^2\text{g}$ pressure should be the highest pressure that the tanks will see and is 49% of the of $16 \text{ oz/in}^2\text{g}$ set pressure of the thief hatch.

A flare tip pressure drop of 0.0 oz/in² was used and was based on information provided by Steffes Flare systems for the Air Assist Model 4. The flame arrestor pressure drop used was 0.72 oz/in² and is based on the Enardo sizing program for a 6" Series 8 inline flame arrestor.

The total gas flow rate to the flare used was 551 Mscfd, and is based on a condensate flash factor and gas composition provided by Marathon Oil. The gas composition used was the average composition from the February 2017 Clarks Creek (MM) Analysis Summary.

Using the same calculation methodology, the total gas flow rate can be increased to 765 Mscfd and stay below the opening pressure of an Enardo ES-660 thief hatch (14.4 oz/in²). This is approximately 1.39 times the normal operating flow.

Standard pressure drop "K" value for fittings and valves per Crane Technical Paper 410 were used. The value used for the absolute roughness of steel was 0.00015 ft.

*Attached are the tabulated results of the hydraulic calculations

Disclaimer:

This assessment meets the certification requirements of 40 CFR part 60 subpart 0000a. It is the responsibility of *Marathon Oil* to comply with the reporting requirements of this regulation.

Attachment 1- Hydraulic Calculations

		H	vdraulic C	alculations								-	
Client	Marathon Ci		ye were o	Basis /									
Project.	TVCS Ventile			Notes ->									
Location: Unit	Lena Facility	(Within Veronica)				8"				40			
Proj #:	16039-06		Am Pre		atm	Atter	KO	tal for	Halfof	Half of			
ByChkd	DJF		Pres Un		flare Sp	KO		to KO	turks :	tanks			
RevDate:	Unstream S	19-Jul-17 egment ID or kno		EGMENT ID		н		J	K	L			
Pressure	Downstream	n Segment ID or I	known pres	psia		9	h	1	3	R .			
Data		essure Up or Doe			d	d	d	d	d	d			
Holdup Method	d (with mag. 2 or) (blankwdefault	iank=Dukler, 3=L-M, 4= 2 =Hoghmark,3=L-M	-Begg-Brill, 5-is 1,4-BAB, 5-Ex	othermal)									
	Pipe Rough	ness		Section 2	0,00015	0.00015	0.00015	0.00015	0.00015	0.00015			
Pipe		e Size or Internal 0, std, etc.) Blank		Inches	4.000 ski	8.000	24.000 ald	6.000 std	6.000 std	4 000 sld			
	Straight pipe	elength		1 6	20.0	101.2	8.0	506.6	14.9	61.0			
Elev- ation	Inlet & Outle		Inlet Outet										
	Difference		Difference		0.0	0.0	0.0	0.0	0.0	0.0			
	90's	Std (R/D=1), thre Short Radius (R		hablas				DOM:					
SK Method	90's	Standard (R/D=	1.5), all type	15		2		3		3			
		Mitered	1 weld (90	deg angle) deg angle)									
		The same of	3 weld (30	deg angle)									
	Choose type	Plug Valve Brand Plug Valve Straig	h Flow										
	45'9	Short Radius (R	(D=1), all ty	pes	The state of the s								
Elbows	45'1	Standard (R/D= Mitered, 1 weld,						2	P. S. Sand				
		Mitered, 2 weld.	22.5 deg ar										
	Choose type	Ball Valve Full Po	N		Cara Maria	Charles and	MACHINES.						1
	180's	Close Return (R Close Return (R											
	180	Standard (R/D=	1.5), all type	5	British metals	COMPANY	Contract of			I The East	-		
	Used	Standard (R/D= Long-radius (R/I	D=1.5) thre	aded			-				1		
****	an	Standard (R/D+)	1), flanged o				-	-	CONTRACTOR OF STREET	HE SHAPE STREET	ST CHES	No.	1000
Tees	Flow-	Stub-in type bran Threaded	n¢h										
	thru	Flanged or Weld			E-Marine San	1		2		3	Designation of the last of the		
	Tee	Stub-in type brain Full line size, Be	nch da=1.0	_									100
	Gate, Ball or Plug	Reduced trim, B	leta=0.9										
	Globe, stand	Reduced trim, 8	eta=0.8										
Valves	Globe - (Ang	le or Y-type) or Di	aphragm (d	fam type) *					201				
	Butterfly	Lit - min vel (ti	ala SElidan									Chicago and Chicago	
	Check	Swing - min vel								1			
	Day February	Tilting-disk ce/Exit?(0=none,1	nante See	20 52 5 4 10 2									
		ameter (at end)	-610_2-61	in		4.000				8.500			-
Other	Orifice Diam			in									
UP		tom Diameter ure Drop (Equip.	etc)	in psi	0.000	0.045	-						
		Pressure Drop (E		# Buid									
	Miscellaneo	n-fashing liquid us Flow Resistan	onlyr) ICB	gomps? 5 K factor									
	Flow (provid	e mass OR volum	e basis)	lb/hr						ILL STREET		ARTHUR DE	
Liquid	Density			gpm b/t3									
	Viscosity			cP					Chicago and C				
	Flow Rate	sion (2 phase on	3)	dyne/cm lb/hr	1,763	1,763	1,763	1,763	882	882			
	Density on		Density	10/83				Section 1					
Vapor			2WV		29.14 0.994	29.14	29.14 0.994	29.14	29.14	29.14			-
	200		Temp	The same of	115.0	115.0	115.0	115.0	115.0	115.0			
Pipe interne	Vapor Visco	sity		CP in	2010	6.065	23.250	6.065	6.065	4.026	17 1 1 1 1 1		
	p Calculation	Methods			DukHugh	DukiHugh	DukHugh	DukHugh	DukHugh	DukHugh			
	Flow rate Flow rate			lb/hr		0	0	0	0	0			
Liquid	Density			gpm lb/83	0.0	0.00	0.0	0.00	0.00	0.00			
	Viscosity	rian (2 character)		cP	0.00	0.00	0.00	0.00	0.00	0.00			
	Flow Rate	sion (2 phase on	E	dyneicm	0.00 1763	1763	1763	1763	882	882			
Vapor	Vapor Visco			¢P	0.010	0.010	0.010	0.010	0.010	0.010			
	Vapor Densi	trage Pressure		ps ig 15/93	0.04	0.12	0.17	0.0653	0.38	0.0660			
	Bulk Density			6/13	0.06	0.06	0.0646	0.0653	0.0656	0.0660			
	Pipe Flow A	88		12	0.0884	0.2006	2.9483	0.2006	0.2006	0.0884			
Flow	Bulk Velocity Erosional Ve	locity if solids pre	nect	ft/sec	86.39 394.85	37.83	2.56 392.91	37,40 391,39	18.55 389.86	41.95 389.12			
Para-	Average Visi	osity		cp	0.010	0.010	0.010	0.010	0.010	0.010			
meters		ange (Outlet-Inlet umber (NRe))	t	0.0 2.71E+05	0.0 1.80E+05	0.0 4.69E+04	0.0 1.80E+05	8.99E+04	0.0 1.35E+05			
	Friction Fact	orf (Colebrook &	White)		0.0181	0.0179	0.0215	0.0179	0.0198	0.0193			
	K (straight p K (fittings +)	pe)			1.08	3.59	0.09	17.97	0.58	3.52			
	K (entrance	exit + swages +			0.00	1.04	0.00	1.01	0.00	0.31			
Friction		eous Flow Resist		ve Cvj	0.00	0.00 5.44	0.00	0.00	0.00	0.00			
		d (Average Densi	ty Basis)	f fluid	115.97	22.24	0.09	21.50	5.35	8.06 27.34			
	Equivalent le	ingth			25.0	153.3	8.0	606.1	38.9	139.7			
		ressure before Ch		psig	II.	0.1697	0.1697	0.38183	0.38556	0,487	<0	7.8	oz inż
		stream Control V stream pressure		psig		0.17	0.17	0.38	0.39	0.49		49%	
TOTAL.	Static Head	Pressure Drop		psi	0.00	0.00	0.00	0.00	0.00	0.00			
	A SUPPLEY PROBLE	ure Drop (Equip &	(Andrea)	ps:	0.00	0.05	0.00	0.00	0.00	0.00			1
	Friction Pres					1.47E-03	6.75E-06	1.43E-03	3.53E-04	1.80E-03		1	1
	Friction Pres Acceleration	Factor			7.66E-03								
	Friction Pres Acceleration Total System	Factor Pressure Drop	before C.V	pai	0.07	0.10	0.00	0.21	0.00	0.10		1	1
	Friction Pres Acceleration Total System Segment Do Available Do	Factor Pressure Drop winstream Pressuresteam Control		paig paig	0.07 0.00	0.10	0.00	0.17	0.38	0.39			
	Friction Pres Acceleration Total System Segment Do Available Do	Factor Pressure Drop winstream Pres.		pei peig	0.07 0.00	0.10	0.00						



VERONICA FACILITY TANK BATTERY VENT LINE DESIGN AND CAPACITY ASSESSMENT

	ACCULTON-
Marathon Oil	(b) (6)
John Van Pelt	
Tim Archuleta, Nate Mascarenas, Kendra Meeker	
June 12, 2017	
Veronica Facility- Vent Line Design and Capacity Assessment	
	John Van Pelt Tim Archuleta, Nate Mascarenas, Kendra Meeker June 12, 2017

The US EPA finalized "Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After September 18, 2015" on June 3, 2016. This regulation has requirements for certifying the design of closed vent systems. An assessment of the closed vent must be performed to determine it is of sufficient design and capacity to ensure that all emissions from storage vessels are routed to the control device or process and have it certified by a qualified professional engineer. This regulation is 40 CFR 40 Subpart OOOOa, referred to as the Quad Oa regulation.

Certification for 40 CFR 60.5411a(d):

"I certify that the closed vent system design and capacity assessment was prepared under my direction or supervision. I further certify that the closed vent system design and capacity assessment was conducted and this report was prepared pursuant to the requirements of subpart Quad Oa of 40 CFR part 60. Based on my professional knowledge and experience, and inquiry of personnel involved in the assessment, the certification submitted herein is true, accurate, and complete. I am aware that there are penalties for knowingly submitting false information."

Purpose:

Evaluate the new Veronica facility tank battery vent line design to ensure that the Enardo ES-660 thief hatches, which are set at 16 oz/in² will not open during normal operating flow rate scenarios. The normal flow path for the vapor from the storage tanks will be to one flare where the off gas will be combusted to meet Quad Oa regulations.

Results:

Based on the 3D model of the vent system and predicted vapor flow rates, Halker Consulting evaluated the pipe routing from the storage tanks to the flare and calculated the expected pressure drop in the system during the Marathon Oil specified maximum predicted vapor flow rates. The pressure at the outlet of the flare was set at local atmospheric pressure of approximately 13.46 psia. Pressure drop through the piping system from the furthest storage tank to the flare was calculated and found to have a backpressure on the tank battery of 0.72 psig (11.5 oz/in²g).

During normal operating conditions the $11.5 \text{ oz/in}^2\text{g}$ pressure should be the highest pressure that the tanks will see and is 72% of the of $16 \text{ oz/in}^2\text{g}$ set pressure of the thief hatch.

A flare tip pressure drop of 0.0 oz/in² was used and was based on information provided by Steffes Flare systems for the Air Assist Model 4. The flame arrestor pressure drop used was 1.45 oz/in² and is based on the Enardo sizing program for a 4" Series 8 inline flame arrestor.

The total gas flow rate to the flare used was 328 mscfd (1049 lb/hr), and is based on a condensate flash factor and gas composition provided by Marathon Oil. The gas composition used was the average composition from the February 2017 Clarks Creek (MM) Analysis Summary. Credit was taken for the VRT thereby reducing the amount of flashed gas that was calculated using the provided flash gas factor.

Using the same calculation methodology, the total gas flow rate can be increased to 371 MSCFD (1187 lb/hr) and stay below the opening pressure of an Enardo ES-660 thief hatch (14.4 oz/in²). This is approximately 1.13 times the normal operating flow.

Standard pressure drop "K" value for fittings and valves per Crane Technical Paper 410 were used. The value used for the absolute roughness of steel was 0.00015 ft.

*Attached are the tabulated results of the hydraulic calculations

Disclaimer:

This assessment meets the certification requirements of 40 CFR part 60 subpart 0000a. It is the responsibility of *Marathon Oil* to comply with the reporting requirements of this regulation.

Attachment 1- Hydraulic Calculations

		H	tydraulic C	alculations			-							
Client:	Marethon Or			Basis /	Para la									
Project.	TVC\$ Ventile			Notes →	7		5	4	. 3	2	1	<= segment		
Location: Unit	Veronica Fac	nety			*	4"	.6"		6"	4"	4"			
Proj #:	18039-06			13.46	atm	After	Outlet	КО	Before	full flow	Halfof			
ByChk'd	MP		Pres Uni	pola EGMENT ID	flare fip	ко	ofKO		KO Drum	to KO	tanks M			
RevDate:	Upsteam 5	6-Jun-17 egment ID or kno		pois	G	H	-	,	K	L	- 86			_
Pressure	Downstream	n Segment ID or	known press	pela		g	h	1	1	k	1			
Data		essure Up or Do			d	d	d	d	d	d	d			
Holdup Meth	(blank/default	Senio-Duktor 34, 40, 4 2 HHughmark, 34L-8	M 4+848 5+Ea	ion)		2010			-	100				
	Pipe Rough	ness			8 86015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015			
Pipe	Nominal Lie Schedule /4	e Size or Internal 0, std, etc.) Blank	Diameter	Inches.	4 000 ski	4.000	6.000	24.000 40d	6.000	4.000	4.000 abd	-		
	Straight pipe	length		1 8		std 166.6	7.8	81d 8.0	7.8	51d 301.9	195,4			
Elev- ation	Inlet & Outle OR		Outel				1150		701/2011/20	TO A COLUMN				
eeon	Difference	(Outlet - Inlet)	Difference		0.0	0.0	0.0	0.0	0.0	0.0	0.0			
	80,8	Std (R.D=1), thr					11 51 54		1					
3K Method	90%	Short Radius (F. Standard (R.D.	1.5), all type	s eloed			2	200	100	5	2			
			1 weld (90	deg angle)					10000	F2000	1945	100	1	
		Miered	2 weld (45	deg angle) deg angle)						(C) - (C)		-		
	Choose type	Plug Valve Bran	ch Flow	ord and of	10000	5 - 115		777.7	Trace.	14/00/201				
	Choose type	Plug Valve Straig	ght Thru							17 10 10 10				
Elbows 1	45%	Short Radius (F.D.	1.5), all type	pes 4					-		-		_	
		Mitered, 1 weld.	.45 deg angl	ie .	200	400				STATE OF THE PARTY.				
	Choose he d	Mitered, 2 weld, Sall Valve Full P	22.5 deg an	gle		-		10		2000				
		Close Return (F	R/D=1), three					THE U.S.	1990					
	180's	Close Return (F Standard (R/D+	RO+1), figd/4	welded				-	1000000		1-1-1			
	Used	Standard (RIO»	1.5), all type: 1), threaded	9					2200					
	25	Long-radius (R)	(D+1.5), three			-						THE REAL PROPERTY.		
Tees	Elbow	Standard (R/D+ Stub-in type bra	1), flanged o	ir welded					1	1	2			-
	Flow-	Threaded							Legacon and	ALC: N	1000			
	thru	Flanged or Well	ded				1		The lates	2	-11	1000		
	Gate, Balt	Stub-in type bra	eta=1.0	_					1		1			
	or Plug	Reduced trim, 8	Beta=0.9				2 2 2 2 3 3			100	1-72			
	Globe, stanc	Reduced birm, 8	Beta=0.8						100				_	
Valves		le or Y-type) or D	Xaphragm (d	am type) *	7									
	Bulterfly	Lift - min vol (ft	Die Western						75.55		-			
	Check	Swing - min vel	(8/s)= 40/(de	ns (0/83)*.5							1			
		Tilting-disk												
	Pipe Entrand	ce/Exit?(0=none,) ameter (at end)	1=entr_2=ex				4 000		2	6,000	1			
Other	Orifice Diam	eter		in in			2.000							
DP	Initial Swage	Inm Diameter ure Drop (Equip.			0.000	0.091					-			
		Pressure Drop (E		f fluid	0.000	0.001								
	Valve Cv (No	n-fashing liquid	only)	gomber 5 K factor										
		us Flow Resistar e mass OR volum		K factor					-					
Liquid		Times City (1910)		gpm	-			200				111		
	Density			B/R3	-					-				
	Surface Ten	sion (2 phase on	nly)	dyne/cm			1777	TO SEASON	1000			THE RES		
	Flow Rate Density OR I		Density	lb/hr lb/83	1049,42	1049.42	1049.42	1049.42	1049.42	1049.42	524.71			
Vapor	Density OR I	W.Zai	MW	ID/RJ	29.14	29.14	29.14	29.14	29.14	29.14	20.14			-
2.4			2		0.994	29.14 0.994	0.994	29.14 0.994 115.0	29,14 0.994	29.14 0.994	29.14 0.954			
	Vapor Viscor	ilv	Temp	di di	115.0	115.0	115.0	0.010	115.0	0010	115.0			
Pipe Interne	al Diameter	-		in	4.026	4.026	6.065	23.250	6.065	4.026	4.026			
DP / Holdus	Calculation	Wethods			DukHugh	DukHugh	DukiHugh	DukHugh	DukHugh	DukHugh	DukHugh			
	Flow rate Flow rate			gpm		0.0	0.0	0.0	0.0	0.0	0.0			
Liquid	Density			gpm lb/83		0.00	0.00	0.00	0.00	0.00	0.00			
	Macosity Surface Ten	sion (2 phase on	nike.	dyne.km	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
	Flow Rate			Buthr	1049	1049	1049	1049	1049	1049	525			
Vapor	Vapor Viscos			op make	0.010	0.010	0.010	0.010	0.010	0.010	0.010		_	
	Vapor Densi	erage Pressure by (Aug.)		psig Ib/R3		0.13	0.0652	0.0652	0.0653	0.45	0.0672			
	Bulk Density		•	643	0.06	0.08	0.07	0.07	0.07	0.007	0.007			
	Pipe Flow A	ea		62	0.0884	0.0884	0.2006	2 9 4 8 3	0.2006	0.0884	0.0884			
Flow	Bulk Velocity			t/sec	51.55 395.38	51.05 393.46	22.27 391.53	1,52 391,48	22.26 391.44	49.87 388.88	24.54 385.83		-	1
Para-	Average Visc	elocity if solids properly	a and	#/sec	0.010	0.010	0.010	0.010	0.010	0.010	0.010			
	Elevation Ch	ange (Outlet-Inlet	0		0.0	0.0	0.0	0.0	0.0	0.0	0.0			
meters	Friction Fact	imber (NRe) or f (Colebrook I	L WASH		1.61E+05 0.0190	1.61E+05 0.0190	1.07E+05 0.0193	2.79E+04 0.0241	1.07E+05 0.0193	1.61E+05 0.0190	8.06E+04 0.0207			
	K (straight p	pe)			0.00	9.42	0.30	0.10	0.50	17.06	12.14			
	K (fittings + s		a selford		0.00	0.00	1.04	0.00	1.02	0.31	6.48 0.61			
Friction	K (Miscellan	eas - swages - eous Flow Resis	stance + Valv	e CV)	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
	Total K				0.00	9.42	2.01	0.10	1.46	20.12	19.23			
	Velocity Hea Equivalent le	d (Average Dens Ingth	ruk grazie)	# fluid	4129	40.50 166.6	7.71 52.7	8.0	7.70	38.64 355.9	9.36			
		ressure before C	v	pelg	-	0.2622	0.2692	0.2692	0.27430	0.53224	0.716	61	11.5	og.in2
	Available Up	stream Control V	Valve DP	pai						-				1
TOTAL	Segment Up	steam pressure		peig	0.00	0.26	0.27	0.27	0.27	0.63	0.72			1
TOTAL		Pressure Drop ure Drop (Equip	& Allow)	psi	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
	Friction Pres	sure Drop		pe	0.00	0.17	0.01	0.00	0.01	0.36	0.08			
	Acceleration	Factor Pressure Drop			2.73E-03 0.00	2 67E-03 0 26	5 09E-04 0.01	2 36E-06 0.00	5.08E-04 0.01	2.55E-03 0.36	6.18E-04 0.08			1
	Segment Do	wastream Pres	before C.V.	paig	0.00	0.00	0.26	0.00	0.01	0.30	0.63			
	Available Do	winstream Contri	di Valve DP	pelg		2000								
	Pressure at Error Status	er Control Valve		peig	0,0000 OK	0,0000 CK	0.2622 OK	0.2692 CK	0.2692 CK	0.2743 CK	0.6322 CK			1
	Cities annual				- Con					-	-		_	-

Sherman USA Pad

SHERMAN USA CTB VENT LINE DESIGN AND CAPACITY ASSESSMENT

Matter

		Sapo Licano
TO:	Marathon Oil	(b) (6)
FROM:	Tim Archuleta	
CC:	Nate Mascarenas, Kendra Meeker	
DATE:	July 12, 2017	
RE:	Sherman USA CTB - Vent Line Design and Capacity Assessment	

The US EPA finalized "Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After September 18, 2015" on June 3, 2016. This regulation has requirements for certifying the design of closed vent systems. An assessment of the closed vent must be performed to determine it is of sufficient design and capacity to ensure that all emissions from storage vessels are routed to the control device or process and have it certified by a qualified professional engineer. This regulation is 40 CFR 40 Subpart 0000a, referred to as the Quad Oa regulation.

Certification for 40 CFR 60.5411a(d):

"I certify that the closed vent system design and capacity assessment was prepared under my direction or supervision. I further certify that the closed vent system design and capacity assessment was conducted and this report was prepared pursuant to the requirements of subpart Quad Oa of 40 CFR part 60. Based on my professional knowledge and experience, and inquiry of personnel involved in the assessment, the certification submitted herein is true, accurate, and complete. I am aware that there are penalties for knowingly submitting false information."

Purpose:

Evaluate the new Sherman USA CTB vent line design to ensure that the Enardo ES-660 thief hatches, which are set at 16 oz/in², will not open during normal operating flow rate scenarios. The normal flow path for the vapor from the storage tanks will be to one flare where the off gas will be combusted to meet Quad Oa regulations.

Results:

Based on the vent system 3D model (dated 7-10-2017) and predicted vapor flow rates, Halker Consulting evaluated the pipe routing from the storage tanks to the flare and calculated the expected pressure drop in the system during the Marathon Oil specified maximum predicted vapor flow rates. The pressure at the outlet of the flare was set at local atmospheric pressure of 13.5 psia. Pressure drop through the piping system from the furthest storage tank to the flare was calculated and found to have a backpressure on the tank battery of 0.52 psig $(8.3 \text{ oz/in}^2\text{g})$.

During normal operating conditions the $8.3 \text{ oz/in}^2\text{g}$ pressure should be the highest pressure that the tanks will see and is 52% of the of $16 \text{ oz/in}^2\text{g}$ set pressure of the thief hatch.

A flare tip pressure drop of 0.0 oz/in² was used and was based on information provided by Steffes Flare systems for the Air Assist Model 4. The flame arrestor pressure drop used was 0.34 oz/in² and is based on the Enardo sizing program for a 6" Series 8 inline flame arrestor.

The total gas flow rate to the flare used was 345 Mscfd (1,103 lb/hr), and is based on a condensate flash factor and gas composition provided by Marathon Oil. The gas composition used was the average composition from the February 2017 Clarks Creek (MM) Analysis Summary. Credit was taken for the VRT thereby reducing the amount of flashed gas that was calculated using the provided flash gas factor.

Using the same calculation methodology, the total gas flow rate can be increased to approximately 462 Mscfd (1,480 lb/hr) and stay at or below the opening pressure of an Enardo ES-660 thief hatch (14.4 oz/in²). This is approximately 1.3 times the normal operating flow.

Standard pressure drop "K" value for fittings and valves per Crane Technical Paper 410 were used. The value used for the absolute roughness of steel was 0.00015 ft.

*Attached are the tabulated results of the hydraulic calculations

Disclaimer:

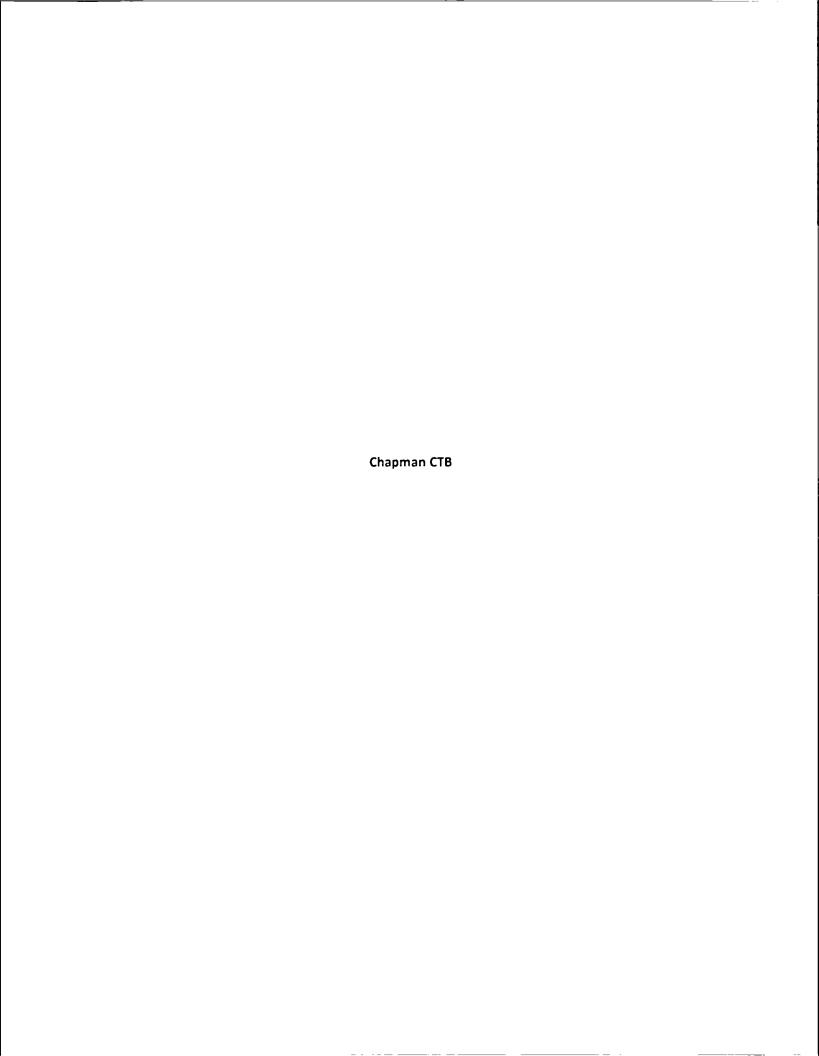
This assessment meets the certification requirements of 40 CFR part 60 subpart 0000a. It is the responsibility of *Marathon Oil* to comply with the reporting requirements of this regulation.

Attachment 1 - Normal Flow Hydraulic Calculations

		H	ydraulic C	alculations									1 37
Client	Marsthon Oil			Basis /						1	- 3		
Project: Location:	Sherman Fa			Notes ->		7	. 6			3	2	1	es segmen
Jnit Proj #:	TVCS Norma	i Flow Calculatio	Aim Pres	135	4" abn	Delining.	DUBM of KO	Ontarion.	54"	6" Upsteam	2	4" Half of	
BYCNKE			Pres Uni		fore Sp	CHESTON	COURT OF NO	Copper of AC	Drum	of KO	Upstream of KO	tenks	
RevDate:		12-Jul-17		EGMENT ID	6	Н		3	K	L	М	N	
Pressure		egment ID or kno s Segment ID or k		pela	13.50	G	H	The second	3	K	-	н	
Data	is known pr	issure Up or Dov	vnstream (U	or D)?	d	d	d	8	0	d	d	d	
Fric Method Holdup Meth	(blank=default,	tenin-Dukter, SHL-M, e- 2 => kughererik, SHL-M	6+99-8+8.5+5 4+080.5+6s	othernel) (ton)									
	Pipe Rough	ness		THE RESERVE	0.00015	0.00015	0.00015	0,00015	0.00015	0.00015	0.00015	0.00015	-
Pipe	Schedule (4	e Size or Internal 0, std, etc.) Blank		Inches	4.000 ald 15.0	000.0 bte	4.000 std	8.000 s/d	24.000 etd	8.000 std 10.0	4.000 sMd	4 000 std	
Elex	Streight pipe intet & Outle	length	Inlet		15.0	93d 128.0	1.0	5 0	8.0	10.0	267.0	148.0	
ation	OR		Outlet	-			and the same of						
	Difference 90's	(Outlet - Inlet) Std (P.D=1), the	Difference		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
3K Method	90's	Short Radius (R	MD=1), figdA	welded						-			
an meerod	905	Standard (R/D=	1 weld (90	deg angle)		-		1		1		3	
		Mitered	2 weld (45	deg angle) deg angle)									
	Choose type	Plug Valve Brand	oh Flow	org angle)									
	Choose type	Plug Valve Brand Plug Valve Straig Short Radius (R	(O=1), all te	pes				Marketon and					
Elbows .	45%	Standard (R/D+	1.5), all type	5		1			The same		DESTRUCTION OF		
		Miered, 1 weld, Miered, 2 weld, Ball Valve Full Po	22.5 deg and	ngle									-
	Choose type	Close Return (R	Off	haha		Contract of	-						
	180's	Close Return (R	UD=1), figd/	welded		1	1 mars 2 mg	No. S. Est	-	The Control			-
	180 Used	Standard (R/D= Standard (R/D=	1.5), all type 1), threaded	9	Charles and the Control of the Contr	No.							-
	85	Long-radius (RI	D+1.5), thre	aded			No.				Name of the least		
Tees	an Elbow	Standard (R/D+ Stub-in type bra	nch	weiged	BACT STATE OF STATE O			Marie Street		1		2	1
	Flow-	Threaded Flanged or Weld	ted		The second second	-						6	
	Tee	Stub-in type bra	nch		The second								
	Gate, Ball	Full line size, Be Reduced trim, B									1	1	I Company
	or Plug Globe, stand	Reduced trim, 8	leta=0.8		The State of the S	Part of	The SHADE		-				
Valves	Globe - (Ang	te or Y-type) or Di	laphragm (d	tam type)						To the same of	THE RESERVE OF		- 17
	Butterty	Lift -min vel (fi	Nie 35 Edan	a INSTANCE			Discussion of the last				ET ALEX	Total State of	No. of Lot
	Check	Swing - min vel									and the same of	1	
	Pipe Entran	Titing-disk te Ext?(0=none,1	-entr_2-en	et3=both)						1		1	-
00.44	Swage to Di	ameter (at end)		in		4.000	6.000	4.000	6.000		8.000		
Db Other	Orifice Diam Initial Swage	ton Diameter		in in								2000	
	Other Press	ure Drop (Equip.) Pressure Drop (E	etc)	# Buid	0.000	0.021							
	Valve Cv (No	in-flashing liquid	only)	gpresipar* 5	Service of the least of the lea				1000		-		
		us Flow Resistar e mass OR volum		K fector								APL AND	
Liquid	Density			gpm 8A3						Version 1			
	Viscosity			cP.									
	Surface Ten Flow Rate	sion (2 phase on	70	dynalon	1104.08	1104.58	1104.58	1104,08	1104.08	1104.08	1104.08	552.04	
tion.	Density OR	MUZAT "	Density	613	SCHOOL STREET	A Robbinson Co.		ALC: UNKNOWN	THE RESERVE OF THE PERSON NAMED IN				
Vepor			Z		20.14 0.994	29.14 0.964 115.0	29.14 0.994	29.14 0.994	29.14 0.994	29.14 0.994	29,14 0.994	29.14 0.994	
	Vapor Visco	Ob	Temp	F	115.0	115.0	0.010	0.010	0.010	115.0	0.010	0.010	
	al Diameter			in	4.026	6.065	4.026	6.065	23.250	6.065	4.028	4.026	
DP / Holdu	Flow rate	Methods		BA:	DukHugh	DukHugh	DukHugh	DukHugh	DukHigh	DukHugh	DukHugh	DukHugh	
	Flow rate			gpm (#d	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Liquid	Density Viscosity			60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Surface Ten	sion (2 phase on	ly)	dyne/cm	0.00	1104	0.00	0.00	0.00	0.00	0.00	0.00	
Vapor	Flow Rate Vapor Visco			Ibhr cP	1104 0.010	0.010	0.010	0.010	1104 0.010	1104 0.010	0.010	552 0.010	
		erage Pressure		psig	0.01	0.04	0.07	0.07	0.08	0.08	0.26	0.48	
_	Vapor Densit		-	Ib/83	0.0642	0.0644	0.0645	0.0645	0.0645	0.0646	0.0654	0.0665	-
	Pipe Flow A	68		1/2	0.0884	0.2006	0.0884	0.2006	2.9483	0.2006	0.0884	0.0884	
Flow	Bulk Velocity	locity if solids pr	esent	filtec filtec	54.02 394.63	23.75	53.79 393.76	23.69 393.66	1.61 393.63	23.88 393.80	53.03 390.98	26.10 387.88	1
Para-	Average Visi	tosity	•	CP	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	
meters		ange (Outlet-Inlet umber (NRe)	0		0.0 1.73E+05	1.15E+05	1.73E+05	1.15E+05	3.00E+04	0.0 1.15E+05	0.0 1.73E+05	8.66E+04	
		orf (Colebrook &	White)		0.0188	0.0190	0.0188	0.0190	0.0237	0.0190	0.0188	0.0205	
	K (Stings +)	valves)	•		0.84	0.99	0.06	0.19	0.10	0.38	16.10	9.05 5.83	
Friction	K (entrance K (Macretter	ext - swages + eous Flow Resis	tance + Vot	e CV	0.00	0.43	0.00	0.43	22.82 0.00	0.61	0.31	0.61	
	Total K	eous Flow Resis			0.84	8.77	0.52	9.87 8.72	22.92	1.24	18.23	15.49	
	Equivalent is	d (Average Densingth		R fluid	15.0	165.8	9.3	23.1	1874.1	8.72 32.8	43.70 325.0	10.58 253.3	
	Upstream P	ressure before C stream Control V		polig	0.0171	0.0626	0.0731	0.0765	0.07691	0.08172	0.44464	253.3 0.52	E3 osig
	Segment Up	isbeam pressure		peig	0.02	0.06	0.07	0.08	0.08	0.06	0.44	0.52	
TOTAL	Static Head	Pressure Drop ure Drop (Equip I		pai pai	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
	Friction Pres	sure Drop		psi	0.02	0.02	0.01	0.00	0.00	0.00	0.36	0.08	1
	Acceleration Total System	Pressure Drop		pai	2.99E-03 0.02	5.79E-04 0.05	2.97E-03 0.01	5.76E-04 0.00	2.67E-06 0.00	5.75E-04 0.00	2.88E-03 0.36	6.99E-04 0.08	
	Segment De	wnsteam Pres.		peig	0.00	0.02	9.06	9.07	0.08	0.08	0.08	0.44	
	Pressure at	ar Control Valve	- Value UP	beil	0.0000	0.0171	0.0626	0.0731	0.0765	0.0769	0.0817	0.4445	1
	Error Status				OK	OK.	OK.	OK	OK	CK	OK	OK	1

Attachment 2 - Maximum Flow Hydraulic Calculations

			ydraulic Ca	alculations		Ti .		1		100	3311		3 1376
Client	Marsifton Cit		100	Basis /	State of the					14000			
Project Location:	Sharman Fe	100		Notes ->		,		5		3	2	1	ex segment
Unit: Proj #:	TVCS Maxim	um Flow Calcula	Aim Pres	13.5	alex	District NO.	Outset of KD	Company NO	24°	Upersem	4* Upstram	4" Halfol	
ByChk'd			Pres Unit	pala	fate to	-	Opper or no	Constitution	Drum	OFKO	pf KO	tanks	
RevOate:	Unalteam S	12-Jul-17 egment ID or kno		GMENT ID:	6	H	1	,	K	L	M	N	
Pressure	Downsteam	s Segment ID or	known press	psie	13.50	G	H	1	3	K	-	и	
Pric Method		essure Up or Dov			d	9	d	- 6	d	6	d	0	
Holdup Meth	(blankndefault,	2 Highners, 3-L-6	44-868.5-Ea	ton)								-	
Pipe		e Size or Internal		Inches	0.00015 4.000	0.00015 6.000	0.00015 4.000	6,00015 6,000	0.00015 24.000	0.00015 8.500	4.000	0.00015 4.000	
	Schedule (4 Straight pipe	0, std, etc.) Blank length	if I.D. given	above	15.0	6MI 126.0	s.td	std 5.0	#Md 8.0	10 g	#Md 287,0	148 D	
Elev- ation	Straight pipe Inlet & Outle OR		inlet Outlet				No.	THE REAL PROPERTY.					
wson	Difference		Difference		0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	
	90%	Std (R/D+1), bin Short Radius (R		unided									
SK Method	90%	Standard (R/D=	1.5), all types	5		2		100		1	1	3	
		Mitered		deg angle)									
	Choose type	Plug Valve Brand	3 weld (30 ch Flow	deg angle)									
	Choose type	Plug Valve Straig	thru						Cert of		T DOM:		
Elbows *	45%	Short Radius (R Standard (R/D=	1.5), all types	5		1				-	and the	-	
		Mitered, 1 weld, Mitered, 2 weld,	22.5 deg an	gle				The second					
	Cheose type	Ball Valve Full P	ort		-					(ACCESS)			The same
	180's	Close Return (R	(D=1), figd/	velded	Charles Street	BESCH	Bernett .	Direction of			Contract of	-	
	180 Used	Standard (R.D» Standard (R.D»	1), threaded		The state of the s	1	Name and Address of the Owner, where		THE COLD	Total Control	The second second	HELE	
	es an	Long-radius (R/D=									CONTRACTOR OF STREET	2	
Tees	Elbow	Stub-in type bra						PER SE	COLUMN TWO				District of the last
	Plow- thru	Threaded Flanged or Welc	ded			1					1	8	
	Tee	Stub-in type brain Full line size, Be		_			-						-
	Gate, Ball or Plug	Reduced tilm, 8	lets+0.9	- 1									
	Globe, stand												
Valves	Globe - (Ang Butterfly	le or Y-type) or Di	laphragm (d	am type)								Trans.	Marin Co.
		Lift - min vel (8											
	Check	Swing - min vel Tilting-disk								17.00			
	Pipe Entrand	e/Exit?(0=none,1 ameter (at end)	entr., 2-ex	(3=both)		4.000	6.000	4.000	8.000	THE REAL PROPERTY.	8.000	1	
Other	Orifice Diam	eter		in			-	-		DEPLOY NAMED	I Charles		
Ob	Other Press	tram Diameter ure Drop (Equip.	etc.)	in pai	0.000	0.034		1.0					
	Other Head	Pressure Drop (E	Equip, etc.)	# fluid gpm/ps/-5							Secretary of the last		
	Miscellaneo	us Flow Resistant e mass OR volum	nce	K factor			Market	The Real Property lies	Company		ET BASES		
Liquid		e mass CREVOIUM	ie casis)	gpm pM3	-			MAN PROPERTY.	No. of the last		100		1000
	Density Viscosity			Ib/8.3				Balance Control	Control of		-	DESCRIPTION OF	
	Surface Ten	sion (2 phase on	(4)	dyse/cm	1478.51	1478.51	1478.51	1478.51	1478.51	1478.51	1478.51	739.25	
	Density on a	MCZ67	Density	10.43		17			D.C. C. Control	Maria Laboratoria	District Control	RESIDENCE.	
Vapor			Z		29.14	29 14 0.994	29.14 0.904	29.14 0.994	29.14 0.994	29.14 0.994	29.14	29,14	
	Vapor VIsco	illy.	Temp	CP CP	115.0 0.010	0.010	0.010	0.010	0.010	0.510	115.0	0.010	
	al Diameter			in	4.026	6.065	4.020	6.065	23.250	6.065	4.026	4.026	
UP / Hotou	Plow rate	NET TOTAL		Bhr	DukHugh	DukHugh	DukHugh	DukfHugh 6	DukHugh	DukHugh	DukiHugh	Duk/Hugh 0	
Liquid	Flow rate Density			gpm Ib/\$3	0.00	0.00	0.0	0.0	0.00	0.0	0.00	0.0	
	Misconity	des O stares		CP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Flow Rate	sion (2 phase on	70	dyne/cm lb/hr	1479	1479	1479	1479	1479	1479	1479	739	
Vapor	Vapor Viscor Segment Av	sity orage Pressure		c ^p paig	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	
	Vapor Densi	tly (Airgi)	•	15/83	0.0642	0.0645	0.0847	0.0648	0.0648	0.0648	0.0663	0.0681	
	Bulk Density Pipe Flow A			15/9.3 92	0.06	0.06	0.06	0.06	0.06 2.9483	0.06	0.07	0.07	
Flow	Bulk Velocity	,		t/sec	72.31	0.2006 31.74	71.78	0.2006 31.60	2.15	31.58	70.04	34.09	
Para-	Erosional Vi Average Vision	locity if solids pro	esent	#/sec	394.53	393.76 0.010	393.07 0.010	392.89	392.85	392.76 0.010	388.28 8.010	383.12	
meters	Elevation Ch	ange (Outlet-Inlet umber (NRe)	0	1	0.0 2.32E+05	0.0 1.54E+05	0.0 2.32E+05	0.0 1.54E+05	0.0 4.02E+04	0.0 1.54E+05	0.0 2.32E+05	0.0 1.16E+05	
meme	Friction Fact	or f (Calebrook &	White)		0.0183	0.0183	0.0183	0.0183	0.0222	0.0183	0.0183	0.0197	
	K (straight p K (Strings + v	raives)	•		0.82	4.63 0.99	0.05	0.18	0.00	0.36	15.65	8.70 5.81	
Friction	K (entrance	+ axit + swages + eous Flow Resis	orifice)	e Cvi	0.00	0.43	0.31	0.43	22.73	0.61	0.31 0.00	0.61	
	Total K	d (Average Densi	- Wall		0.82	6.05 15.66	0.52	0.86	22.82	1.22	17,78	15.12	
	Equivalent le	ingth		f fluid	81.26 15.0	167.2	80.07 9.5	15.52 23.8	1991.9	15.50	76.23 326.1	18.06 257.3	
	Upstream P	ressure before C stream Control V	V Valve DP	peig	0.0298	0.1061	0.1249	0.1309	0.13161	0.14014	0.76747	0.90	14.3 oslg
	Segment Up	atream pressure		paig	0.03	0.11	0.12	0.13	0.13	0.14	0.77	0.90	
TOTAL	Other Press	Pressure Drop ure Drop (Equip I	& Allow)	psi psi	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Friction Pres Acceleration	sure Drop		psi	0.03 5.37E-03	0.04 1.03E-03	0.02 5.29E-03	0.01 1.02E-03	0.00 4.74E-06	0.01 1.02E-03	0.62 5.03E-03	0.13 1.19E-03	
				pai	0.03	0.08	0.02	0.01	0.00	0.01	0.63	0.13	
	Total System												
	Total System Segment Do Available Do	wnsteam Pres.		paig	0.00	0.03	0,11	0.12	0.13	0.13	0.14	0.77	
	Total System Segment Do Available Do	wnsteam Pres, wnsteam Conti er Control Valve			0.000 0.0000 CK	0.0298 OK	0,11 0,1061 OK	0.12 0.1249 OK	0.13 0.1309 OK	0.13 0.1316 CK	0.14 0.1401 OK	0.77 0.7675 OK	





Chapman Facility Tank Battery Vent Line Design & Capacity Assessment

		The state of the s
TO:	Marathon Oil	(b) (6)
FROM:	Tim Archuleta	
CC:	Nate Mascarenas, Kendra Meeker	
DATE:	June 22, 2017	
RE:	Chapman Facility- Vent Line Design and Capacity Assessment	

The US EPA finalized "Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After September 18, 2015" on June 3, 2016. This regulation has requirements for certifying the design of closed vent systems. An assessment of the closed vent must be performed to determine it is of sufficient design and capacity to ensure that all emissions from storage vessels are routed to the control device or process and have it certified by a qualified professional engineer. This regulation is 40 CFR 40 Subpart 0000a, referred to as the Quad Oa regulation.

Certification for 40 CFR 60.5411a(d):

"I certify that the closed vent system design and capacity assessment was prepared under my direction or supervision. I further certify that the closed vent system design and capacity assessment was conducted and this report was prepared pursuant to the requirements of subpart Quad Oa of 40 CFR part 60. Based on my professional knowledge and experience, and inquiry of personnel involved in the assessment, the certification submitted herein is true, accurate, and complete. I am aware that there are penalties for knowingly submitting false information."

Purpose:

Evaluate the new Chapman facility tank battery vent line design to ensure that the Enardo ES-660 thief hatches, which are set at 16 oz/in² will not open during normal operating flow rate scenarios. The normal flow path for the vapor from the storage tanks will be to one flare where the off gas will be combusted to meet Quad Oa regulations.

Results:

Based on the 3D model of the vent system and predicted vapor flow rates, Halker Consulting evaluated the pipe routing from the storage tanks to the flare and calculated the expected pressure drop in the system during the Marathon Oil specified maximum predicted vapor flow rates. The pressure at the outlet of the flare was set at local atmospheric pressure of 13.5 psia. Pressure drop through the piping system from the furthest storage tank to the flare was calculated and found to have a backpressure on the tank battery of 0.57 psig (9.2 oz/in²g).

During normal operating conditions the $9.2 \text{ oz/in}^2\text{g}$ pressure should be the highest pressure that the tanks will see and is 57% of the of $16 \text{ oz/in}^2\text{g}$ set pressure of the thief hatch.

A flare tip pressure drop of 0.0 oz/in² was used and was based on information provided by Steffes Flare systems for the Air Assist Model 4. The flame arrestor pressure drop used was 1.3 oz/in² and is based on the Enardo sizing program for a 6" Series 8 inline flame arrestor.

The total gas flow rate to the flare used was 789 mscfd (2,525 lb/hr), and is based on a condensate flash factor and gas composition provided by Marathon Oil. The gas composition used was the average composition from the February 2017 Clarks Creek (MM) Analysis Summary.

Using the same calculation methodology, the total gas flow rate can be increased to approximately 1.1 mmscfd (3,680 lb/hr) and stay at or below the opening pressure of an Enardo ES-660 thief hatch (14.4 oz/in²). This is approximately 1.5 times the normal operating flow.

Standard pressure drop "K" value for fittings and valves per Crane Technical Paper 410 were used. The value used for the absolute roughness of steel was 0.00015 ft.

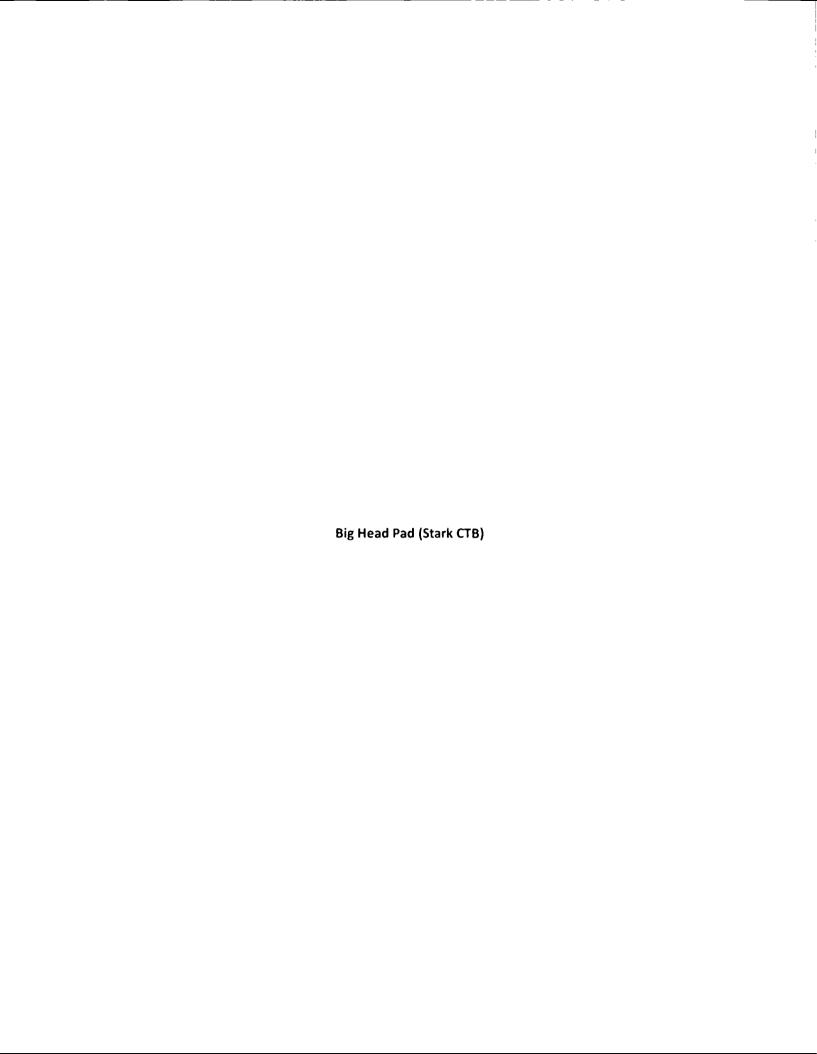
*Attached are the tabulated results of the hydraulic calculations

Disclaimer:

This assessment meets the certification requirements of 40 CFR part 60 subpart 0000a. It is the responsibility of *Marathon Oil* to comply with the reporting requirements of this regulation.

Attachment 1- Hydraulic Calculations

Unit: Proj #: By/Chl/d. Rev/Date: Pressure	Marathon Oil TVCS Ventilin Chapman Fe 16039-10			Basis / Notes>								
Location: Unit: Proj #: By/Chk'd: Rev/Date: Pressure	Chapman Fa			TWOIRES TO								
Unit: Proj #: By/Chl/d. Rev/Date: Pressure	1000											
By/Chir'd. Rev/Date: Pressure	10039-10		Alm Press	13.45	-	6	36°	6.	6-			
ReviDate: Pressure		TMA	Alm Pres Pres Unit		fare to	Outlet of KO	Drum	to KO	Half of tanks			
Pressure				EGMENT ID	G	н	I I	J	K			
		22-Jun-17 igment ID or known		psia								
Data		Segment ID or kno ssure Up or Downs		psia 12	13.46 d	9	ď	d	d			
		stank=Dukter, 3=L-M, 4			-					11000		-
Holdup Meth		*Hughmark,3*L-M,4	*B&B,5*Eaton))	0.00018	0.00016	0.00015	0.00015	0.00015			
Pipe	Pipe Rought Nominal Line	Size or Internal Di	am eter	Inches	0.00015 6.000	0.00015 8.000	36,000	6.000	6.000	_		
	Schedule (4)	, std, etc.) Blank if		ve	std	std		ald 205.5	std 130.5			
Elev-	Straight pipe Inlet & Outlet	length	iriet	n n	1.0	129.0	8.0	205.5	130.5			
ation	OR		Outlet	ft				-				
	Difference 90's	(Outlet - Infet) Std (R/D=1), thre	Difference	T.	0.0	0.0	0.0	0.0	00		-	
	1	Short Redius (R/	D=1), figd/well	ded		1			1			
3K Method	90's	Standard (R/D=1	5), all types 1 weld (90 d	lan social		2		2	2			
		Mitered	2 weld (45 d	leg angle)								
	Charreton	Plug Valve Branch	3 weld (30 d	leg angle)							-	
	Choose type	Plug Valve Straigh	nt Thru									
	45's	Short Radius (R/	()=1), all types	1	1-	-		22170707			1	
Elbows	45'8	Standard (R/D=1 Mitered, 1 weld, 4						7				
	Obs	Mitered, 2 weld, 2	2.5 deg angle									
	Choose type	Ball Valve Full Por Close Return (R/	()=1) Evreade	d								
	180's	Close Return (R/	D=1), figd/wel						100000			
	180 Used	Standard (R/D=1 Standard (R/D=1	.5), all types									
	85	Long-radius (R/D	=1.5), threade									
Tees	an Elbow	Standard (R/D=1 Stub-in type bran		velded					1			
	Flow-	Threaded								71	1	
	thru	Flanged or Welde							8			
	Gate, Ball or	Stub-in type bran Full line size. Bet	a= 1.0	_		1		1	1			
	Plug	Reduced trim, Be										
	Globe, stand	Reduced trim, Be	eta=0.8				7	1000		7 2.0		
Valves	Globe - (Angle or Y-type) or Diaphragm (dam type)		type)			- 10	100	-		10000		
	Butterfly	Lift - min vei (ft/s	s)= 35/(dens 8	b/ft3)^5				Service of		-		
	Check	Swing - min vel (I				and the second			1			
	Dina Entranc	Tilting-disk e/Exit?(0=none,1=	entr. Spent 3:	shoth)				2	1			-
	Swage to Dia	meter (at end)		in		4.026						
Other	Orifice Diam	ter from Diameter		in in								
-	Other Press	ire Drop (Equip, etc	c.)	psi	0.000	0.083						
		Pressure Drop (Eq. n-fashing Equid on		ft fluid								-
	Mscelaneou	s Flow Resistance	917	gpm/psi*.5 K factor								
0.74	Flow (provide	mass OR volume	basis)	lb/hr								
Liquid	Density			gom lb/ft3								
	Viscosity			cP								-
	Flow Rate	ion (2 phase only)		dyne/cm lb/hr	2525.00	2525,00	2525.00	2525.00	2525.00			
	Flow Rate Density OR N	W. Z&T	Density	lb/ft3								
Vapor			MW Z		29.14 0.994	29.14 0.994	29.14	29.14 0.994	29 14 0 994			
	Maria Santa		Temp	CP CP	115.0	115.0	115.0	115.0	115.0			
Pipe Internal	Vapor Viscos	ity		cP in	0.010 6.065	6.065	0.010 36.000	6.065	6.065			
	Calculation M	ethods		- "	Duk/Hugh	DukHugh	Duk/Hugh	Duk/Hugh	Duk/Hugh			
	Flow rate			Ibhr		0	0	0.0	000			
Liquid	Flow rate Density		,	gpm lb/ft3	0.00	0.00	0.00	0.00	0.00			1
	Viscosity	low PR eb		¢P	0.00	0.00	0.00	0.00	0.00			
	Flow Rate	ion (2 phase only)		dyne/cm lb/hr	2525	0.00 2525	0.00 2525	0.00 2525	0.00 2525			
Vapor	Vapor Viscos			cP	0.010	0.010	0.010	0.010	0.010			
		rage Pressure		psig	0.00	0.10	0.21	0.30	0.48			
	Vapor Density Bulk Density			Ib/ft3	0.0640	0.0845	0.0650	0.0684	0.0662			
	Pipe Flow An			ft2	0.2006	0.2006	7.0686	0.2006	0.2006			
Flow	Bulk Velocity			ft/sec	54.65	54.23	1.53	53.48	52.78			
Para-	Average Viso	ocity if solids prese	ent	ft/sec cP	395.37 0.010	393.86	392 36	391.11 0.010	388.55			
	Elevation Cha	nge (Outlet-Inlet)		ft	0.0	0.0	0.0	0.0	0.0			
meters	Reynolds Nu Friction Fact	mber (NRe) or f (Colebrook & V	Athites		2.57E+05 0.0172	2.57E+05 0.0172	4.34E+04 0.0217	2.57E+05 0.0172	2.57E+05 0.0172			
	K (straight pi	pe)			0.03	4.39	0.06	7.00	4.44			
	K (fittings + v	ext + swages + c	orifice)		0.00	1.02	0.00	1.01	4.45 0.61			
Friction	K (Miscellane	ous Flow Resistar		v)·	0.00	0.00	0.00	0.00	0.00			
	Total K	(Average Density	Basis)	ft fluid	0.03	45.70	0.06	8.65	9.50			-
	Equivalent le		masis/	It liuid	1.0	177.8	8.0	254.0	279.0			
		essure before CV		psig		0.2075	0.20751	0.38260	0.57234	<=	9.16	oz.in2
	Available Up	tream Control Valv	re DP	psi	1							
TOTAL	Static Head	stream pressure Pressure Drop		psig	0.00	0.21	0.21	0.38	0.57			
	Other Press	ire Drop (Equip & i	Allow)	psi	0.00	0.08	0.00	0.00	0.00			
	Friction Pres Acceleration			psi		0.12 3.02E-03	0.00 2.39E-06	0.17 2.93E-03	0.19 2.86E-03			
	A CHARLES BOOK IN	a service .			S 000C-003	STATE OF THE STATE	E 200 UK					
	Total System	Pressure Drop		psi	0.00	0.21	0.00	0.18	0.19		1	
	Total System Segment Do	Pressure Drop wnstream Pres , b wnstream Control (efore C.V.	psig psig	0.00	0.21	0.00	0.18	0.19			





STARK FACILITY TANK BATTERY VENT LINE DESIGN AND CAPACITY ASSESSMENT

		ACTIVITY OF THE PARTY OF THE PA
TO:	Marathon Oil	(b) (6)
FROM:	Tim Archuleta	X
CC:	Kendra Meeker, Nate Mascarenas	
DATE:	September 12, 2017	
RE:	Stark Facility- Vent Line Design and Capacity Assessment	

The US EPA finalized "Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After September 18, 2015" on June 3, 2016. This regulation has requirements for certifying the design of closed vent systems. An assessment of the closed vent must be performed to determine it is of sufficient design and capacity to ensure that all emissions from storage vessels are routed to the control device or process and have it certified by a qualified professional engineer. This regulation is 40 CFR 40 Subpart 0000a, referred to as the Quad 0a regulation.

Certification for 40 CFR 60.5411a(d):

"I certify that the closed vent system design and capacity assessment was prepared under my direction or supervision. I further certify that the closed vent system design and capacity assessment was conducted and this report was prepared pursuant to the requirements of subpart Quad Oa of 40 CFR part 60. Based on my professional knowledge and experience, and inquiry of personnel involved in the assessment, the certification submitted herein is true, accurate, and complete. I am aware that there are penalties for knowingly submitting false information."

Purpose:

Evaluate the new Stark facility tank battery vent line design to ensure that the thief hatches, which are set at 16 oz/in² will not open during normal operating flow rate scenarios. The normal flow path for the vapor from the storage tanks will be to one flare where the off gas will be combusted to meet Quad Oa regulations.

Results:

Based on the 3D model (dated 7.20.2017) of the vent system and predicted vapor flow rates, Halker Consulting evaluated the pipe routing from the storage tanks to the flare and calculated the expected pressure drop in the system during the Marathon Oil specified maximum predicted vapor flow rates. The pressure at the outlet of the flare was set at local atmospheric pressure of approximately 13.46 psia. Pressure drop through the piping system from the furthest storage tank to the flare was calculated and found to have a backpressure on the tank battery of 0.4 psig (6.5 oz/in²g).

During normal operating conditions the 6.5 oz/in²g pressure should be the highest pressure that the tanks will see and is 40% of the of 16 oz/in²g set pressure of the thief hatch.

A flare tip pressure drop of 0.0 oz/in² was used and was based on information provided by Steffes Flare systems for the Air Assist Model 4. The flame arrestor pressure drop used was 0.8 oz/in² and is based on the Enardo sizing program for a 4" Scries 8 inline flame arrestor.

The total gas flow rate to the flare used was 265 Mscfd (848 lb/hr), and is based on a condensate flash factor and gas composition provided by Marathon Oil. The gas composition used was the average composition from the February 2017 Clarks Creek (MM) Analysis Summary. Credit was taken for the VRT thereby reducing the amount of flashed gas that was calculated using the provided flash gas factor.

Using the same calculation methodology, the total gas flow rate can be increased to approximately 405 Mscfd (1,296 lb/hr) and stay at or below the opening pressure of an Enardo ES-660 thief hatch (14.4 oz/in²). This is approximately 1.5 times the normal operating flow.

Standard pressure drop "K" value for fittings and valves per Crane Technical Paper 410 were used. The value used for the absolute roughness of steel was 0.00015 ft.

*Attached are the tabulated results of the hydraulic calculations

Disclaimer:

This assessment meets the certification requirements of 40 CFR part 60 subpart 0000a. It is the responsibility of *Marathon Oil* to comply with the reporting requirements of this regulation.

Attachment 1- Normal Flow Hydraulic Calculations

			Hydraulic C	alculations								
Client: Project:	Meration O			Basis / Notes ->	,			1		-		
ocation:				mar -					3	2		ww sagme
Proj #	Normal Flov	VI BOB	Ann Pres	13.46	alon .	Abor	Outlet.	KO	Before	La low	Halfof	
ByChkid		DJF	Pres Uni		Bare Sp	KO	efixo		KO Drum	to KO	tente	
tevDate:	Upsteam S	12-Sep-17 egment (0 or kn	own press.	EGMENT ID	0	н	1	1	K	L	м	
ressure		n Segment ID or essure Up or Do				9	ь	No. of Concession, Name of Street, or other Persons, Name of Street, or ot	3		100	
ric Method	(wetening Zori	Name Out or Del-Mile	e-Begg-B-K Sens	ethermal)	4	-	9	d	0	and the same	4	
kkdup Meth	(blank-defaut) Pipe Rough	2 Hughmerk 3-L-	M.4-868.5-Ea	(on)	0.00015	0.00013	6.00015	0.00015	*****	*****		
Pipe	Nominal Line Size or Internal Diameter Inches			4 000	4.000	8.000	24.000	8,000	0.00016 4.000	0.00021 4.000		
	Schedule (40, std. etc.) Blank if I D. given above Straight pipe length			above A	20.0	142.0	6.0	8.0	14.0	201.5	168.5	552 h to
Bev-	OR OUSe	t	Inlet Outet	-								200 11 10
	Difference 90's	(Outet-inlet)	Difference	2	0.0	0.0	6.0	0.0	0.0	0.0	0.0	
		Sid (R/D=1), the Short Radius (R/D+1) fordly	welded		-				-		
K Method	90's	Standard (R/D	1.5), all types	dan anda)		3			100	FOLK CO.	2	
		Miered	2 weld (45	deg angle)							100	
	Choose type	Plug Valve Bran	nch Flow	deg angle)			-					
	Choose type	Plug Valve Stra Short Radius (ght Thru							Real Property lies	100	
Dows	45'1	Standard (R/D)	1.5), all type:	1								
		Mitered, 1 weld Mitered, 2 weld	1. 22 5 deg an	igle						Edward III		E CONTRACTOR OF THE PERSON OF
	Choose type Ball Valve Full Port Close Return (R:O=1), threaded				Whether to	-		DE COLUMN				10000
	180's	Close Return (R/D=1), \$96%	welded		1	-	DESCRIPTION OF	1000	Berlin House	-	
	180 Used	Standard (R.D. Standard (R.D.	*1), fireaded		Carrier Control			The same of			THE RESERVE	-
	85	Long-radius (R Standard (R/D)	UD=1.5), three	aded	COMPANIE DE		De Local		ALC: N		-	
Tees	Ebow	Stub-in type bri	ench	n menusu			Landson.	1			-	
	Flow- thru	Threaded Flanged or We	ided								10	
	Tee	Stub-in type bro Full line size, 8	anch	_		100				The same of		
	Gate, Ball or Plug	Reduced tim.	Beta=0.9								1	-
	Globe, stan							Total Control				
Alves	Globe - (Angle or Y-type) or Diaphragm (dam type) Butterty				BOOK TO SE	The Control			200			
	Lift - min vel (t/s)= 35-(dens (b/85)*.5			Contract of the Contract of th								
	Check	Tilling-disk ce/Exit?(0=none	(#s)= 40/(de	ens (0/83)*.5							1	Contract of the Contract of th
Other OP	Pipe Entran	ce/Exit?(0=none, ameter (at end)	frent, 2res				4,000		2	6 DO0	1	
	Orifice Diameter				1000	4,000			8 000			
	Initial Swage than Diameter In Other Pressure Drop (Equip, etc.)				0.050		-				1000	
	Other Head Pressure Drop (Equip, etc.)			A STATE OF THE PARTY OF THE PAR		-					Bong dP Prough 4-a	
	Macellaneo	us Flow Resista le mass OR volu	ince	gon/ps/ 5 K factor				ENGINEE S		Lanca L		Series 8
Liquid		e mass OR volu	me basis)	lb/hr gomi					District to			
	Density But3									Title Tolling	Life or	
		sion (2 phase or	nly)	dyne/cm lb/hr	848					Name of Street		
	Density OR	W.Z&T	Density	16-163	THE RESERVE TO SERVE THE PARTY OF THE PARTY	845	848	848	848	848	424	
Vapor	Z			29.14 0.994	0,994	29,14	29.14 0.994	29.14 0.994	29.14	29.14		
	Vapor Visco	alle.	Temp	cP	115.0	115.0	115.0	115.0	115.0	29,14 0.994 115.0 0.010	29,14 0.994 115.0 0.010	
Pipe Intern	al Diameter			in in	4 026	0.994 115.0 0.010 4.026	6.065	23.250	6.065	4.026	4.026	
IP / Holdu	Plowrate	Methods		Ibhr	DukHugh	DukHugh	DukHugh	DukHugh	DukHugh	DukHugh	DukHugh	
Liquid	Flow rate Density			89 m Ro/83	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Lindon	Viscosity			CP CP	0.00	0.00	9.00	0.00	0.00	0.00	0.00	
	Surface Tension (2 phase only) dyne/cm Flow Rate Byhr				848	848	0.00 848	848	0.00 848	0.00 848	0:00 424	-
Vapor	Vapor Visco			¢P.	0.010	0.010	0.010	0.010	0.010	0.010	0.010	
	Segment Average Pressure psig Vapor Density (Avg) but3				0.01	0.09	0.17	0.18	0.18	0.0652	0.0658	
	Bulk Density (Avg.) 16/83				0.06	0.06	0.06	0.06	0.06	0.07	0.07	
Flow	Pipe Flow A Bulk Velocit	y	•	R2 thec	41.63	0.0884 41.37	0.2006	2 9483 1.23	0.2006	0.0884	0.0884 20.26	
Para-	Erosional V	elocity if solids p	resent	* baec	395.27	394.02	392.85	392.82	392.79	391.56	389.97	
		range (Outlet-In)	etj	cP B	0.010	0.010	0.010	0010	0.010	0.010	0.010	
meters		lumber (NRe) tar f (Calebrook	& White)	-	1 30E+05 0.0194	1.30E+05 0.0194	8.64E+04	2.25E+04 0.0253	8.64E+04 0.0199	1.30E+05 0.0194	6.51E+04	
	K (straight) K (fittings *	ripe)	•		1.16	8.23	0,0199	0.10	0.55	11.67	12.38	
Friction	K (entrance	* exit * swages	+ aritce)		0.00	0.82	1.04	0.00	1.02	0.31	0.61	
	K (Mecellaneous Flow Resistance + Valve Cv) Total K				1.16	9.05	1.68	0.00	1.97	14.21	19.31	
		ength	nity Basis)	Ahid	26 94 20.0	26.60 156.2	5.10	0.02	5.10	25.94	6.38	
	Upstream F	ressure before		psig	0.0159	0.1719	42.6 0.17676	0.17576	0.18028	0.34782	0.40380	6.5 019
TOTAL	Segment U	psteam Contol psteam pressu	re	paig		0.17	0.18	0.18	0.16	0.38	0.40	
	Static Head Pressure Drop psi				0.00	0.00	0.00	0 00	0.00	0.00	0.00	
	Priction Pre	ssure Drop	21200)	p4	0.01	0.11	0.00	0.00	0.00	0.00	0.00	
	Acceleration Total System	m Pressure Drop	,	pa	1.78E-03	1.76E-03 0.16	3.37E-04 0.00	1.56E-06 0.00	3.37E-04 0.00	1.71E-03 0.17	4.21E-04 0.06	
	Segment D	ownstream Pres	before C.V.	paig	0.00	0.01	0.17	0.15	0.18	0.18	0.35	
		THE PERSON NAMED IN	THE RESERVE									1
	Pressure a Error Status	fter Control Valve		pelg	0,0000 OK 0,042	0.0139 CK	0,1719 OK 0,018	0.1758 OK 0.001	0.1758 CK 0.018	0.1803 CK 0.542	0.3475 OK 0.021	

10

Attachment 2- Maximum Flow Hydraulic Calculations

		-	lydraulic Ca	alculations		100000		7		John S.	700	
Client:	Marethon Di		The state of	Basis /								
Project. Location:				Notes ->	7		.5	4	3	1	1	<= segmen
Unit: Proj#.	Max Flourate		Alm Pres	13.46	*	4"	5	-		1.5		
ByChkid		DF	Pres Unit		lare to	KO	Dutet of KO	KO	Seture 600 Drum	to KO	Half of	
RevOate:	A	12-Sep-17	56	GMENT ID	G	н		1	K	L	M	
Pressure	Downstear	egment ID or kno a Segment ID or	known press	pale	13,46	-	h	A CONTRACTOR OF THE PARTY OF TH	-	The second second		
Data	Is known pr	essure Up or Do	wnsteam (U	or Di?	d	d	0	1 6	d		4	
risc Method rescup Neth	(bianicwiefault	residua in 34, 46, 4 2 ohtgivert 34, 4	M.4-848.5-Est	(phi								
	Pipe Rough	ness	•	A STATE OF THE PARTY OF THE PAR	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	6.00021	
Pipe	Schedule (4	e Size or Internal 0, std, etc.) Blank		Inches show	4.000	4.000 std	000.3 bis	24.800 #M	6.000	4.000	4 0 00	
Dor	Straight pipe Inlet & Outle	elength	Dolat		20.0	142.0	6.0	8.0	14.0	201.5	188.5	552 8 lutu
ation	OR		Outet			TO SECOND						
	Oxference 90's	(Outset - Inlet) Std (R.O=1), thr	Difference		0.0	0.0	9.0	0.0	0.0	0.0	0.0	
SK Method	90's	Short Radius (F	R/D=1), figd/w						No. of Lot			
an megrag	20.5	Standard (R/D-		deg angle)					Section 1		2	
		Misred		deg angle) deg angle)		100		-	-			
	Choose hpe	Plug Value Bran Plug Value Strail Short Radius (F Standard (R.O-	ch Flow	deg angle)								
	Choose type	Short Radius (F	gMThru R/D=1), all two	and a								
Elbows	45%	Standard (R/D-	1.5), all types	1						6.254000		
		Mitered, 1 weld Mitered, 2 weld Ball Value Full P				-	The same of		2220			
	Choose type	Ball Value Full P Close Return (I	R/Dath Bush	ded			E SHOULD BE SHOULD BE	Contract of the last		ET SO SON		The same
	180's	Close Return (I	R/D=1), figd/w	velded	LEIE THE	-	District Co.		-	1000		
	180 Used	Standard (R/D= Standard (R/D=	1), threaded			Company of the last	Parameter 1					
	es an	Long-radius (R.D.	(D+1.5), three	aded .			P.S. HOLL	DOM: NO.	Commons			
Tees	Elbow	Stub-in type bra		Meloco						Later and the later is the later in the late	2	
	Flow- thru	Threaded Flanged or Wel	ded								18	
	Tee	Stub-in type bra	inch								10	
	Gate, Ball or Plug	Full line size, B Reduced trim, I			-							10000
	Globe, stan	Reduced trim,	Beta=0 8									
Valves	Globe - (Ang	ple or Y-type) or D	iaphragm (d	am type)								
	Butterfy	Lift - min vel (f	is in Stillane	BATILE Y								
	Check	Swing - min vel	(fru)+ 40fde	nn (b.#3)* 57				The same			1	
	Pipe Entran	Biting-disk ce-Eat?/D*none,	teenb 2-ex	(L3-both)					,		-	1
Other	Swage to Di	ameter (at end)		in in			4.000			6.000		
DP	Initial Swap	tism Diameter		in								-
	Other Pressure Drop (Equip, etc.) Other Head Pressure Drop (Equip, etc.) I fluid					0.113						1.81 owger
	Valve Cv (No	on-Bashing liquid	only")	gom/per1.5							-	Serves 8
	Flow (provid	us Flow Resista e mass OR volun	nce ne basis)	K factor								Daniel I
Liquid	Density			90·m								
	Viscosity			CP CP								
	Surface Ten Flow Rate	sion (2 phase or	riyi	dyne/cm Ib.fv	1,296	1,298	1,296	1,296	7.000	1 800	2/2	
harr	Density OR	W.ZAT	Density	8.93		Name and Address of the Owner, where	THE RESERVE OF THE PERSON NAMED IN	No. of Concession, Name of Street, or other Designation, Name of Street, or other Designation, Name of Street,	1,296	1,298	648	
Vapor			Z Z		29.14 0.994	29,14 0.994	29,14 0.994	0.994	0.994	29.14 0.994 115.0 0.010	29.14 0.994 115.0 0.010	
	Vapor Visco		Temp	ep ep	115,0	0.010	115.0	115.0	115.D	115.0	115.0	
Pipe Intern	al Diameter			in	4 026	4.026	0.010 6.065	23 250	6.065	4,026	4.026	
DP / Holdu	Plow rate	Methods		B.hr	DukHugh	DukHugh	DukHugh	DukHugh	DukHugh	DukHugh	DukHugh	
	Flowrate			gpm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Liquid	Density			6/10 cP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		sion (2 phase or	n/y)	dyne/cm	0.00	0.00	0.00	0.00 1296	0.00	0.00	0.00	
Vapor	Vapor Visco	sity		Ib.hr cP	1296	1296	1296	0.010	1296	1296	0.010	
		erage Pressure		palg	0.02	0.21	0.39	0.39	0.40	0.59	0.83	
	Wapor Dens Bulk Densit		-	16/83 16/83	0.0640	0.0650	0.0658	0.0656	0.0659	0.0668	0 0679	-
	Pipe Flow A	rea		12	0.0884	0.0884	0.2006	2.9483	0 2006	0.07	0.07	
Flow	Bulk Velocit	y elocity if solids pr	as ant	R/sec	63.59 395.15	62.69 392.36	27.27 389.79	1.85	27 25 389 86	61.00	29.98	
Para-	Average Vis	cosity	•	Manc	0.010	0.010	0.010	0.010	0.010	387.03 0.010	0.010	
meters		ange (Outlet-Inle umber (NRe)	10		1.99E+05	1.99E+05	1.32E+05	3.45E+04	1.32E+05	0.0 1.99E+05	9.95E+04	
		or I (Celebrook	& White)		0.0186	0.0186	0.0187	0.0230	0.0187	0.0186	0.0208	
	K (fittings +	values)	•		0.00	7.85 0.81	0.22	0.09	0.52	2.23	6.28	
Friction		e elt - swages leous Flow Resi		e Cvi	0.00	0.00	1.04	0.00	1.01	0.31	0.61	
	Total K	•			1.11	867	1.66	0.00	193	13.68	18.60	
	Equivalent	id (Average Dens engti		R Build	62.84 20.0	61 08 156.7	11.55 44.8	8.0	11.54	57.83	13.96	
	Upstream P	ressure before (prig	0.0310	0.5842	0.39293	0.59294	0.40312	0.77117	0.89380	14.3 os
	Segment U	psteam Control of the second o		paig	0.03	0.38	0.39	0.39	0.40	0.77	0.89	
TOTAL	Other France	Pressure Drop ure Drop (Equip	& Allow)	P1		0.00	0.00	0.00	0.00	0.00	0.00	
	Friction Pres	saure Drop	2.1441	Phi	0.03	0.24	0.01	0.00	0.01	0.37	0.12	
	Acceleration Total System	n Pressure Drop		1 04	4.15E-03 0.03	4.03E-03 0.35	7.63E-04 0.01	3.53E-06	7.62E-04 0.01	3 82E-03 0 37	9.22E-04 0.12	
	Segment D	ownsteam Pres	before C.V.	paig	0.00	0.03	0.38	0.39	0.39	0.40	0.77	
		her Control Valve		paig		0.0310	0.3842	0.3929	0.3929	0.4031	0.7712	
	Error Status Mach numb				0K 0.054	0 0 0 6 4	OK 0.028	0K 6 002	0 028	0 0 0 0 3		

Stohler 41 CTB

STOHLER 41 CTB VENT LINE DESIGN AND CAPACITY ASSESSMENT

		The state of the s
TO:	Marathon Oil	(b) (6)
FROM:	Tim Archuleta	
CC:	Nate Mascarenas, Kendra Meeker	
DATE:	August 30, 2017	
RE:	Stohler 41 CTB - Vent Line Design and Capacity Assessment	

The US EPA finalized "Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After September 18, 2015" on June 3, 2016. This regulation has requirements for certifying the design of closed vent systems. An assessment of the closed vent must be performed to determine it is of sufficient design and capacity to ensure that all emissions from storage vessels are routed to the control device or process and have it certified by a qualified professional engineer. This regulation is 40 CFR 40 Subpart 0000a, referred to as the Quad Oa regulation.

Certification for 40 CFR 60.5411a(d):

"I certify that the closed vent system design and capacity assessment was prepared under my direction or supervision. I further certify that the closed vent system design and capacity assessment was conducted and this report was prepared pursuant to the requirements of subpart Quad Oa of 40 CFR part 60. Based on my professional knowledge and experience, and inquiry of personnel involved in the assessment, the certification submitted herein is true, accurate, and complete. I am aware that there are penalties for knowingly submitting false information."

Purpose:

Evaluate the new Stohler 41 CTB vent line design to ensure that the Enardo ES-660 thief hatches, which are set at 16 oz/in², will not open during normal operating flow rate scenarios. The normal flow path for the vapor from the storage tanks will be to one flare where the off gas will be combusted to meet Quad Oa regulations.

Results:

Based on the vent system 3D model (dated 8/16/2017) and predicted vapor flow rates, Halker Consulting evaluated the pipe routing from the storage tanks to the flare and calculated the expected pressure drop in the system during the Marathon Oil specified maximum predicted vapor flow rates. The pressure at the outlet of the flare was set at local atmospheric pressure of 13.5 psia. Pressure drop through the piping system from the furthest storage tank to the flare was calculated and found to have a backpressure on the tank battery of 0.67 psig (10.8 oz/in²g).

During normal operating conditions the $10.8 \text{ oz/in}^2\text{g}$ pressure should be the highest pressure that the tanks will see and is 67% of the of $16 \text{ oz/in}^2\text{g}$ set pressure of the thief hatch.

Calculations:

A flare tip pressure drop of 0.0 oz/in² was used and was based on information provided by Steffes Flare systems for the Air Assist Model 4. The flame arrestor pressure drop used was 1.79 oz/in² and is based on the Enardo sizing program for a 6" Series 8 inline flame arrestor.

The total gas flow rate to the flare used was 971 Mscfd, and is based on a condensate flash factor and gas composition provided by Marathon Oil. The gas composition used was the average composition from the February 2017 Clarks Creek (MM) Analysis Summary.

Using the same calculation methodology, the total gas flow rate can be increased to approximately 1140 Mscfd and stay at or below the opening pressure of an Enardo ES-660 thief hatch (14.4 oz/in^2). This is approximately 1.17 times the normal operating flow.

Standard pressure drop "K" value for fittings and valves per Crane Technical Paper 410 were used. The value used for the absolute roughness of steel was 0.00015 ft.

*Attached are the tabulated results of the hydraulic calculations

Disclaimer:

This assessment meets the certification requirements of 40 CFR part 60 subpart 0000a. It is the responsibility of *Marathon Oil* to comply with the reporting requirements of this regulation.

This evaluation does not consider the destructive efficiency of the controlled device or components upstream of the tank vent design.

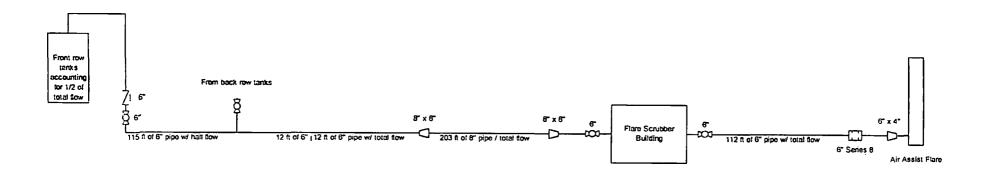
Attachment 1 - Normal Flow Hydraulic Calculations

Client	Misrathon Oil		lic Calculations Basis /										
Project:	Stohler 41 C		Notes ->	1									
Location		San Marian San San San San San San San San San S		1									
Unit Proj #:	Normal Oper	ating Scenario	Pres 13.5	alm	Dutiet of KO	6" MARK 16"	ко	6"water at	Upstream	Upstream	Half of	Half of	
ByChkid	SCEO		s Unit pala	flure to	WIFA	NO bldg	Drum	KO bldg	SLKO 8.	PLKO 6.	tanks yaive	Sanks	
RevDate:	FI	18-Aug-17	SECMENT IO	0	н	- 1	3	K	L	M	N	0	
Pressure		egment ID or known pre Segment ID or known			G	H	-	3	K	L	H	No.	-
Data		essure Up or Downstrea	m (U or D)?	d	d	d	d	d	4	d	d	d	
Fric Method Heldup Meth	(blank=default)	turk+Dukter, 3×1, 46 , 4×8+gp 8: 2 =64ughermek, 3×1, -68, 4×8-88	il, (machemal) (S=Eaton)										
	Pipe Rough	ness	A CONTRACTOR OF THE PERSON NAMED IN	0.00015	0.00015	0.00015	0.00015	0.00015	6.00015	0.00015	0.00015	0.00015	
Pipe	Schedule (4	e Size or Internal Diame 0, std, etc.) Blank if I.D. (4 000	8.000 bits	6.000 skt	24 000 ald	6.000 std	8 000 81d	6,000 std	6.000 ski	6,000	
	Straight pipe Inlet & Outle	length liniet		20.0	112.0	The Real Property lies	# ld 4.0		203.0	12.0		115.0	442 ft total
Elev- ation	OR Cutte	Outlet											Total State of State
	Difference 90's	(Outlet - Inlet) Differ	ence	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	905	Std (R/D=1), threaded Short Radius (R/D=1),	figd/welded										
3K Method	80.8	Standard (R/D=1.5), al	d (90 deg angle)		3							200	
		Mitered 2 wel	d (45 deg angle)							1000			10-10
	Phones her	Plan Value Branch Flow	d (30 deg angle)										
	Choose type	Plug Valve Straight Thin Short Radius (R/D=1),	Residence in contract	-		1000	1						
Elbows	45's 45's	Short Radius (R/D=1), Standard (R/D=1.5), al	all types										
2.000		Mitered, 1 weld, 45 dep	angle	Marie Control	The same of			THE REAL PROPERTY.	PER SE				-
	Choose type	Mitered, 2 weld, 22.5 d Ball Valve Full Port	eg angle										
		Close Return (R/D=1).			No.	Contract of				100000	Contract of		No.
	180's 180	Close Return (R/D=1), Standard (R/D=1.5), el	ngd/welded types			The state of							
	Used	Standard (R/D=1), three	aded					-				(Contract)	-
	90	Long-radius (RID+1.5) Standard (RID+1), fan							1			2	Part of the last
Tees	Elbow	Stub-in type branch	.,		1	Despite a serie	Charles 1	-	ALC: UNKNOWN	-	Destroit	LOCK CO.	-
	Flow- thru	Threaded Flanged or Welded			1								
	Tee	Stub-in type branch				1000	No. of Concession, Name of Street, or other party of the last of t					-	1
	Gate, Ball	Full line size, Bets=1.0 Reduced trim, Bets=0.	9							The second second			100
	or Plug	Reduced trim, Beta=0.											
Valves	Globe, standard Globe - (Angle or Y-type) or Diaphragm (dam type)												-
tunus	Butterfly						and the same of						
	Lift - min vel (ft/s)= 35/(dens lb/ft3)*.5 Check Swing - min vel (ft/s)= 49/(dens lb/ft3)*.5												
	united.	Titing-disk e/Ext?(0+none,1+entr.)	The state of the s								12 12 12 12	No. of Lot	
	Pipe Entrano	eÆxt?(0=none,1=entr., smeter (at end)	2*ext3*both)		4.000	1		2	6,000	8.000			
Other	Orifice Diam	eler	in in		7000	10000						District of	1
OP	Other Press	tom Diameter ure Drop (Equip, etc.)	in pal	0.000	0.112								
	Other Head	Pressure Drop (Equip, e	(c) Third	A CONTRACTOR OF THE PARTY OF TH	0.110				ALC: UNKNOWN		ALC: NO	De la constant	1.79 onig dP through 6-inch
		Ascellaneous Flow Resistance Klacker											Servs 8
		mass OR volume basi	s) Bhr		-				122.20		10000		
Liquid	Density		gpm Ib/fi3										
	Viscosity		cP										
_	Flow Rate	sion (2 phase only)	dyne/cm Ib/h/	3.107	3,107	3,107	3,107	3,107	3,107	3,107	1,262	1,262	-
	Density OR I						ALC: NO.		A RESIDENCE OF THE PERSON NAMED IN	The same			
Vapor		XXV		29.14 0.994	29.14 0.994	29.14 0.994	29.14	2914	29.14 0.994 115.0	29.14 0.994	0.994	29.14 0.994 115.0	
		Temp	CHARLES !	0.994 115.0	115.0	115.0	0.994 115.0	0.994 115.0	115.0	115.0	0.994 115.0	115.0	Description of the last
Pipe Interna	Vapor Visicos Il Diameter	irty	cP in		6.065	0.010	23.250	6.065	7.951	6.065	6.065	6.065	
1 10 10 10 10 10 10 10 10 10 10 10 10 10	Calculation	Methods		DukHugh	DukHugh	DukHugh	DukHugh	DukHugh	DukHugh	DukHugh	DukiHugh	DukHugh	
	Flow rate		form		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Liquid	Density		gpm lb/ft3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Viscosity Surface Ten	sion (2 phase only)	dyne/cm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Flow Rate		Rothr	3107	3107	3107	3107	3107	3107	3107	1262	1282	
Vepor	Vapor Viscor Segment Av	sity erage Pressure	psig	0.010	0.010	0.010	0.010	0.52	0.010	0.010	0.010	0.010	
	Vapor Densi		B/83		0.0658	0.0665	0.0665	0.0666	0.0669	0.0671	0.0672	0.0673	
	Bulk Density	(Aug)	16/83	0.06	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	
Flow	Pipe Flow At Bulk Velocity		8/sec	0.0884 150.99	0.2006 65.38	0.2006 64.70	2.9483	0.2006 64.57	0.3474 37.15	0.2006 64.13	0.2006 26.03	0.2006 25.98	
	Erosional Ve	locity if solids present	Nacc Nacc	393.25	389.83	387.81	387.85	387.41	386.70	386.08	385.87	385.55	
Para-	Average Visc		GP	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	
meters.	Reynolds No	imber (NRe)	-	4.77E+05	3.17E+05	3.17E+05	8.26E+04	3.17E+05	2.41E+05	3.17E+05	1.29E+05	1.296+05	
	Friction Fact K (straight p	or f (Colebrook & White)	1.04	3.74	0.0169	0.0191	0.0169	0.0169 5.15	0.0169	0.0187	0.0187 4.26	
	K (Strings +)	alves)	_	0.27	0.91	0.14	0.00	0.14	1.44	0.17	1.69	2.88	
Friction		exit + swages + orifice eous Flow Resistance		0.00	0.43	0.61	0.00	0.00	0.00	0.18	0.00	0.81	
. Indeed	Total K			1.30	5.08	0.75	0.04	1.16	6.60	0.75	1.69	7.75	-
	Velocity Hea Equivalent le	d (Average Density Basi noth	s) R fluid		66.43 152.1	85.08 22.5	0.30	64.80 34.7	21.45	63.91 22.5	10.53	10,49 209.1	
	Upsteam P	ressure before CV	psig		0.4793	0.50203	0.50204	0.53688	0.60475	0.62720	0.63550	0.67353	10 R osig
	Segment Lin	stream Control Valve Di stream pressure	psig psig		0.48	0.50	0.50	0.54	0.60	0.63	0.64	0.67	
TOTAL	Static Head	Pressure Drop	psi	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Other Press	ure Drop (Equip & Allow sure Drop	psi psi	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Acceleration	Factor		2 34E-02	4.39E-03	4.29E-03	1.99E-05	4.28E-03	1.42E-03	4.22E-03	6.95E-04	6.93E-04	
		Pressure Drop wnsteam Pres, before	C.V. psig	0.21	0.27	0.02	0.00	0.50	0.07	0.02	0.01	0.04	
		wnstream Control Valve				0.4793	0.5020	0.5020	0.5369	0.6048	0.6272	0.6355	
		er Control Valve	peig	6.0000 OK	0.2125 OK	OK	OK	OK			OK		
	Pressure at Error Status Mach numbe	er Control Valve	polg	0154					0.038 0.038	0.665 0.10		CK 0.026 0.02	

Attachment 2 - Maximum Flow Hydraulic Calculations

			ydraulic C	alculations			7	1700	F 13.55		1	-		77-4
Client	Marathon Oil			Basis /										
Project: Location:	Stohler 41 C	TB:		Notes →										
Unit:	Max Flow Squ	onano	Jan Pre	13.5		a Street		-	4 5 14		Vandalin .	and a	Garage.	
Proj #: ByChk'd:		DJF	Pres Un	_	flare to	Outset of KIO	KID bidg	Drum	Street CON	Upstream of KO 8"	Upstream of KD 6*	Half of backs valve	Helf of tunks	
RevDate	F1 5	18-Aug-17	8	EGMENT ID	6	н		J	K	L	М	N	0	
Pressure		egment ID or kno Segment ID or i		paia paia		6	H			-		и	H	
Data	is known pre	esure Up or Dov	insteam (J or D)?	d	8	0	d	d	d	d	d	d	
Fric Method	(witamag. 2 or b	lank-Dukler, S-L-M, G- 2 HHughmark, S-L-N	Segg-B-0, 5-0	etterral)			0.00							
PERGUS MESS	Pipe Rough		(4-080,5-6)	1 8	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	
Pipe		e Size or Internal 0, std, etc.) Blank		Inches	4.000 s/d	8.000 bits	6.000 alsi	24,000	8.000 etd	e doce std	6.000	6.000 ·	8.000	
	Straight pipe	length		1	20.0	112.0		4.0	And in case of	203.0	12.0	-	115.0	442 ft total
Elev- ation	OR Outle		Solet	- 1										
	Difference		Difference	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	90%	Std (R/D=1), three Short Radius (R		welded										-
3K Method	90's	Standard (R/D=	1.5), all type	18	The state of the state of	3	-						2	Charles and
		Mitered	2 weld (45	deg angle) deg angle)								10000		
	Choose head	Plug Valve Brand	th Flores	deg angle)										
	Choose type	Plug Valve Straig	out Thru			Name of the last						National Street		
Elbows *	45% 45%	Short Radius (R/D+	(D+1), all ty	pes						1				
		Mitered, 1 weld.	45 deg ang	le			-	-	the same of	Contract of		Mark Room		-
	Choose type	Mitered, 2 weld, Bull Velve Full Po	PHO				No constant			in the latest and the	Honora Control			
	180's	Close Return (R/D=1), threaded				55500		1	-	THE OWNER OF	N. Park			10000
	180	Standard (R/D=	1.5), all type	15						Table 1				
	Used	Standard (R/D= Long-radius (R/	1), Breaded							Children Sept		2000		
	an	Standard (RIO=	1), flanged		No.	Contract of						a Carrier	2	
Tees	Flow-	Stub-in type brai Threaded	nch						Name and Address of					10000
	Bru	Flanged or Weld				20100		PUSEMB		1	1	-	STATE STATE	
	Gate, Ball	Stub-in type brain Full line size, Be		_					1			1		
	or Plug	Reduced trim, 8	eta=0.9		Contract of the last			N WHITE	Service of				Colores	
	Globe, stand	Reduced trim, 8 ard						The second second			The same of			
Valves	Globe - (Angle or Y-type) or Diaphragm (dam type)											1710755		
	Butterfly Lift - min vel (f/s)= 35/(dens lb/t3)*.5								No.					
	Check	Swing - min vel	(f/s)= 40/(d	ens (b/83)*.5*										
	Pipe Entranc	Titing-disk e/Exit?(0=none,1	*entr., 2*e	et3=both)					2				Desire Land	
Other	Swage to Diam	emeter (at end)		in		4.000				8 000	8.000			
DP	Initial Swage	tism Diameter		In			1		7	-	Maria de la			
	Other Press	ressure Drop (Equip, e Pressure Drop (E	etc.) iquip, etc.)	R Buid	0.000	0.151								2.42 ong dP
	Valve Cv (No	n-fleshing liquid as Flow Resistan	only)	gprepu? 5 K factor				1000						fireigh 5-trich ferres 8
		mass OR volum		g/ps										
Liquid	Density			gpim E/fd										
	Viscosity			OP)					Name of Street					
	Surface Tens Flow Rate	sion (2 phase on	M)	dyne.icm B/hr	3,648	3,648	3,648	3,648	5,648	3,548	3,648	1,262	1,292	
	Density OR N	MV.Z&T	Density	15/83						The second second			98.17	
Vapor		Z Z			29.14 0.904 115.0	29.14 0.994	29.14	29 14 0.994	0994	29.14 0.994	29.14 0.994 115.0	29,14	0.994	
	Vapor Vis con		Temp	CB CB	0.010	115.0 0.010	0.010	0.010	0.994 115.0 0.010	115.0 0.010	115.0	0.994 115.0 0.010	0.994 115.0 0.010	
Pipe Interna	al Diameter			in	4.026	6.065	6.065	23.250	8.065	7.981	6.065	6.065	6.065	
DP / Holdup	Plow rate	Methods		l bhr	DukHugh	Duk/Hugh 0	DukHugh	DukHugh	DukHugh	Dukfflugh	DukHugh	DukHugh	DukHugh	
	Flow rate			gpm B/R3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Liquid	Density Viscosity			P(1)	000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Surface Ten	ion (2 phase on	M	dyne/cm	0.00 3646	0.00 3648	0.00 3848	0.00 3648	0.00 3648	0.00 3648	0.00 3648	0.00	0.00 1262	
Vapor	Flow Rate Vapor Viscon			cP CP	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	
		rage Pressure		palg		0.47	0.67	0.68	0.71	0.78	0.84	0.86	0.88	
-	Vapor Density Bulk Density			Ib/R3	0.0649	0.0664	0.0873	0.0674	0.0675	0.0679	0.0681	0.0682	0.0683	
	Pipe Flow A	ea .		82	0.0884	0.2008	0.2006	2.9483	0.2006	0.3474	0.2006	0.2006	0.2006	
Flow	Bulk Velocity	locity if solids pri	and the same	B/sec	176.75 392.67	76.06 388.05	75.01 385.36	5 10 385 15	74.80 384.82	42.99 383.89	74.13 383.08	25.62 382.82	25.58 382.52	
Para-	Average Visc	osity		CP.	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	
meters	Reynolds No	inge (Outlet-Inlet imber (NRs)	0		0.0 5.60E+05	0.0 3.72E+05	0.0 3.72E+05	970E+04	3.72E+05	0.0 2.83E+05	0.0 3.72E+05	1.29E+05	1.29E+05	
-messers	Friction Fact	or f (Colebrook &	White)		0.0172	0.0166	0.0166	0.0185	0.0166	0.0166	0.0166	0.0187	0.0187	
	K (straight pi K (Strings + v				1.03	3,68 0.91	0.00	0.04	0.00	5.05	0.17	1.69	4.26 2.88	
Ediction	K (entrance	edt + swages +	prifice)	in DA	0.00	0.43	0.61	0.00	1.01	0.21	0.18	0.00	0.61	
Friction	Total K	eous Flow Resis			1.30	5.02	0.75	0.04	1.16	6.71	0.74	1.69	7.75	
	Velocity Hea Equivalent le	d (Average Densi	ty Basis)	R Suid		89.91 152.6	87.44	0.40	88 98 35 2	28.72 269.4	85.39 22.6	10.20 45.5	10.17	
	Upstream Pr	essure before C		psig	25.2 0.2927	0.6536	0.88451	0.68452	0.73196	0.82290	0.85317	0.86133	0.89877	14.4 osig
		stream Control V stream pressure		pelg		0.65	0.68	0.68	0.73	0.82	0.85	0.86	0.90	
TOTAL	Static Head	Pressure Drop		psi	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Other Press	ure Drop (Equip I sure Drop	Aplow)	ps ps		0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
-	Acceleration	Factor			3.20E-02	5.93E-03	5.77E-03	2.67E-05	5.74E-03	1.90E-03	5.64E-03	6.73E-04	6.71E-04	
	Segment Do	Pressure Drop wnsbeam Pres			0.29	0.36	0.03	0.00	0.05	0.09	0.03	0.01	0.04	
	Available Do	wnstream Control Valve				0.2927	0.6536	0.6845	0,6845	0.7320	0.8229	0.8532	0.8613	
	Error Status				II OK	OK	0.6536 CK 0.076	0.6845 OK 0.005	0,8045 CK 0.076	OK 0.044	OK 0.075	OK 0.028	OK 0.026	
				M	0.181	0.078	0.076	0.005	0.078	COLL	0.075	0.038	· 0.000	
	Mach number Homogeneou	s Friction Pres d	rop/1008	psi/100/1		0.14	0.13	0.00	0.13	0.03	0.13	0.02	0.02	

Attachment 3 – Piping Layout



TAT USA 34 Pad



TAT 34 FACILITY TANK BATTERY VENT LINE DESIGN AND CAPACITY ASSESSMENT

		MITTER
TO:	Marathon Oil	(b) (6)
FROM:	John Van Pelt	1/2
CC:	Tim Archuleta, Nate Mascarenas, Kendra Meeker	
DATE:	June 12, 2017	
RE:	TAT 34 Facility- Vent Line Design and Capacity Assessment	

The US EPA finalized "Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After September 18, 2015" on June 3, 2016. This regulation has requirements for certifying the design of closed vent systems. An assessment of the closed vent must be performed to determine it is of sufficient design and capacity to ensure that all emissions from storage vessels are routed to the control device or process and have it certified by a qualified professional engineer. This regulation is 40 CFR 40 Subpart 0000a, referred to as the Quad Oa regulation.

Certification for 40 CFR 60.5411a(d):

"I certify that the closed vent system design and capacity assessment was prepared under my direction or supervision. I further certify that the closed vent system design and capacity assessment was conducted and this report was prepared pursuant to the requirements of subpart Quad Oa of 40 CFR part 60. Based on my professional knowledge and experience, and inquiry of personnel involved in the assessment, the certification submitted herein is true, accurate, and complete. I am aware that there are penalties for knowingly submitting false information."

Purpose:

Evaluate the new TAT 34 facility tank battery vent line design to ensure that the Enardo ES-660 thief hatches, which are set at 16 oz/in² will not open during normal operating flow rate scenarios. The normal flow path for the vapor from the storage tanks will be to one flare where the off gas will be combusted to meet Quad Oa regulations.

Results:

Based on the 3D model of the vent system and predicted vapor flow rates, Halker Consulting evaluated the pipe routing from the storage tanks to the flare and calculated the expected pressure drop in the system during the Marathon Oil specified maximum predicted vapor flow rates. The pressure at the outlet of the flare was set at local atmospheric pressure of approximately 13.46 psia. Pressure drop through the piping system from the furthest storage tank to the flare was calculated and found to have a backpressure on the tank battery of 0.47 psig (7.5 oz/in²g).

During normal operating conditions the 7.5 oz/in²g pressure should be the highest pressure that the tanks will see and is 47% of the of 16 oz/in²g set pressure of the thief hatch.

Calculations:

A flare tip pressure drop of 0.0 oz/in² was used and was based on information provided by Steffes Flare systems for the Air Assist Model 4. The flame arrestor pressure drop used was 1.1 oz/in² and is based on the Enardo sizing program for a 4" Series 8 inline flame arrestor.

The total gas flow rate to the flare used was 276 mscfd (883 lb/hr), and is based on a condensate flash factor and gas composition provided by Marathon Oil. The gas composition used was the average composition from the February 2017 Clarks Creek (MM) Analysis Summary. Credit was taken for the VRT thereby reducing the amount of flashed gas that was calculated using the provided flash gas factor.

Using the same calculation methodology, the total gas flow rate can be increased to 391 MSCFD (1251 lb/hr) and stay below the opening pressure of an Enardo ES-660 thief hatch (14.4 oz/in²). This is approximately 1.41 times the normal operating flow.

Standard pressure drop "K" value for fittings and valves per Crane Technical Paper 410 were used. The value used for the absolute roughness of steel was 0.00015 ft.

*Attached are the tabulated results of the hydraulic calculations

Disclaimer:

This assessment meets the certification requirements of 40 CFR part 60 subpart 0000a. It is the responsibility of *Marathon Oil* to comply with the reporting requirements of this regulation.

This evaluation does not consider the destructive efficiency of the controlled device or components upstream of the tank vent design.

Attachment 1- Hydraulic Calculations

Client Project Location	nt Meration (N ect. TVG8 VenSine			Basis / Notes ->	,				3	2	Ŷ.	⇔ ségment		
Unit Proj#:	16039-02		I Am Pre	13.46	d olm	4" Atlan	8° Ovtet	ко	6" Before	4" full flow				
By/Chk'd		E.O. Ada		et psia	flare to	ко	efKO	NO	KO Drum	to KO	Halfof			
RevDate:	The faces	6-Jun-17 legment ID or kno	S	EGMENT ID		Н		1	K	L	M			1
Pressure	Downstea	m Segment ID or	known press	pais pais		9	h	1	-	1	-		1000	
Data	ta known pr	essure Up or Do	A) meeterw	or Dy?	d	d	d	d	6	0	d		-	-
Friic Metho	d (Hitcheg Sar A Philippints (m. 2	2 Highman 31. M. A	dags bill fre	olfema)		-	2000	1000	10000		1	1		3 7 0
Outp ses	Pige Rough	ness	V-000,0-02	To a	0.00015	0.00015	0.00015	0.00015	0.00015	8,00015	0.00015		100,00	
Pipe		e Size or Internal		Inches	4.000	4.000	8.050	24.000	6.000	4.000	4.000	70000	3	-
	Straight pip	(0, std, sk:) Blank e length	LITLD given	above	bla	128.1	7.6	8.0	7.8	190.3	198.6	1	9.5	
Elev-	Inlet & Outin	t	Inlet		7	140.1	1.0	0.0	1.0	199.3	198.6			
ation	OR Difference	(Outlet - Inlet)	Outet		0.0	0.0	85	6.0				NAME OF STREET		
	90'8	Std (R/D=1), the	esded	,	0.0	0.0	6.0	0.0	0.0	0.0	0.0	V-6.500		1 500
3K Method	90%	Short Radius (R	UD=1), figdA	welded				1000	The state of	200	1000		1	
In Mesiod	10.8	Slandard (R/D=	1.5), all type 11 weld (90	deg angle)		3	1		1	2000	2		5-70	5 25
		Milared	2 weld (45	deg angle)						-			-	
	Choose No.	Plug Valve Brand	3 weld (30	deg angle)				1000	1000	1-2-3	1000	10000	1000	
	Choose type	Plug Valve Straig	phi Thru				-		-	-	-	3000		200
in.	45's	Short Radius (R	(D=1), all by	pes		1 15253	1000		1	1000			1	-
Ibows	40.9	Standard (FUD+ Mibred, 1 weld,	1.5), all type: 45 den anni	S .					1000	-		1		-
	Mitered, 1 weld, 45 deg angle Mitered, 2 weld, 22 5 deg angle Choose type Ball Valve Full Port											-		-
	Choose type	Close Return (R	Mat) there	dad		100,000				1200		12.00		
	180's	Close Return (R	(C=1), Rody	welded		1	-		1			-	-	
_	180 Used	Close Return (R Standard (R/D+ Standard (R/D+	1.5), all types			2 0000	100		100	0.51				
	Used	Long-radius (RA	D×1.5), three	aded				-	2	-				
	80	Standard (R.D+)	1), flanged o	r welded		3	1 - 25			2	2			1
Tees	Flow-	Stub-in type bras Threaded	nch			ACCUPATION			B-507 1	100.00	1000		-	
	thru	Flanged or Weld				1	1000	1	100	3	11		-	2
	Tee	Stub-in type bran	nch			0.000	The same	13		1000				-
	Gate, Balt	Reduced trim, B						-	-					
	at Plug	Reduced trim, B							100000	-	-		-	-
laives	Globe, stand	and le or Y-fype) or Dic	anhouse Hi	an heat					5000	1.00	1000000	120,000	220	
	Butlerty					-		-	-		1			-
	Check	Lit - min vel (th					-			- 13	(Service)		2000	
		Swing - min vel (Tilting-disk		4 2 2 2	-	1		1	-		1			
	Pipe Entranc	a/Exit?(0=none.1	entr., 2=0x	t3=both)			1		2		1			-
Other	Swage to Diam	meter (at end)		in		150	4 000	55	10000-14	6.000	1000	DO-SAL.		7
OP.	Initial Swage from Dismeter									5 m C 40 T	2000			5 155
	Other Press	re Drop (Equip, e Pressure Drop (E)	(k.)	psi E fluid	0.000	830.0			1000					-
	Valve Cv (No	n-Bashing Squid o	envo.	gmbs* 5		-	-		-	100000	3,000	-		2 15
_	Macelaneou	is Flow Resistan	CB .	K factor		1					-		-	-
Jquid	Provigeovate	mass on volum	n basis)	lb/hr com		-								
	Density			gpm lb/t3									-	-
	Viscosity Surface Tens	ion (2 phase on)	4	dyne/cm		-	0.00	1			CONTRACTOR		- 55.5	
	Flow Rate		7	Ib/hr Ib/ft3	883.42	883.42	683.42	683.42	883.42	863.42	441.71		1	-
/apor	Density OR M	Density OR MI ZaT Density			1 97 6 c.		10000	South we	T-10-00-01	100000	9759000 F			
apor		IXW Z			29.14 0.994	29.14	29.14	29.14	29.14	29.14	29.14 0.994	-		
			Temp	F	115.0	115.0	115.0	115.0	115.0	115.0	115.0		1	-
ipe Interna	Vapor Visicos L'Exempler	ity		op in	4.026	4.026	0.010	23.250	0.010	0.010	0.010			100
P / Holdup	Calculation N	M/hods			Duk/Hugh	DukHugh	DukHugh	Duk/Hugh		4.026 Duk/Hugh	4.028 DukHugh	-		-
	Flow rate			lb/hr	0	0	0	0	0	0	0			+
biupi	Flow rate Density			gpm Brit3	0.00	0.0	0.00	0.0	0.00	0.00	0.0			
	Miscosity	X 4 3 3 1 3		CP.	0.00	0.00	0.00	0.00	0.00	0.00	0.00			1
	Surface Tens Flow Rate	ion (2 phase only	0	dyne/cm /b/hr	883	883	0.00	0.00	0.00	0.00	0.00			
apor	Vapor Viscos			CP	0.010	0.010	0.010	883	0.010	0.010	0.010			
	Segment/ve	rage Pressure		psig	0.00	0.11	0.22	0.22	0.22	0.32	0.44			
	Vapor Densit			10/83	0.0640	0.0645	0.0650	0.0650	0.0650	0.0655	0.0661			
	Bulk Density Pipe Flow Are			75/83 82	0.06	0.08	0.07	0.07	0.07	0.07	0.07			
OW	Bulk Velocity			fisec	0.0884 43.39	43.05	0.2006 18.82	1.28	15.61	0.0584 42.39	0.0884			
	Erosional Vel	ocity if solids pre-	sent	f/sec	395.38	393.80	392.21	392.18	392.15	390 80	389.08			
	Average Mack Elevation Cha	nge (Outlet-Inlet)	1	cP #	0.010	0.010	0.010	0.010	0.010	0.010	0.010			
eters	Reynolds Nu	mber (NRe)	, ,		1.36E+05	1.36E+05	9.00E+04	235E+04	9.00E+04	1.36E+05	0.0 6.78E+04	1		
	Friction Factor K (straight pip	f (Colebrook &)	White)		0.0193	0.0193	0.0198	0.0251	0.0198	0.0193	0.0213			
- 1	K (Mings + ve	(and			0.00	7.38	0.30	0.10	0.30	11.49 2.75	6.49			
	K (entrance +	est + swages +)		.	0.00	0.00	1.04	0.00	1.02	0.31	0.61			1
iction	K (Macellane Total K	ous Flow Resists	mice , Althe	O.	0.00	11.46	1.74	0.00	0.00	0.00	0.00			
	Velocity Head	(Average Density	(Basis)	ft fluid	29.26	28.80	5.50	0.10	5.50	14.55	19.71		_	-
_	Equivalent ler	glh			0.0	198.8	44.5	8.0	40.2	252.4	310.5			
		saure before CV		peig	0.0000	0.2162	0.2205	0.2205	0.22442	0.40954	0.472	- es	7,5	os.in2
		tream Control Val	NO UP	psi psig	0.00	0.22	0.22	0.22	0.22	0.44				
DTAL	Static Head F	ressure Drop	. 1	psi	0.00	0.00	0.00	0.00	0.00	0.00	0.47			
	Other Pressul Friction Press	re Drop (Equip &	Allow)	psi	0.00	0.07	0.00	0.00	0.00	0.00	0.00			1
- 1	Acceleration F	actor	1	psi	1.93E-03	0.15 1.90E-03	0.00 3 636-04	1.885-06	0.00 3.63E-04	0.18 1.84E-03	0.08 4.53E-04			1
	Total System	Pressure Drop		psi	0.00	0.22	0.00	0.00	0.00	0.19	0.08			
		nsteam Pres., b nstream Contid!		psig psi	0.00	0.00	0.22	0.22	0.22	0.22	0.41			
- 1	Pressure after	Control Valve	-	paig	0.0000	0.0000	0.2162	0.2205	0.2205	0.2244	0.4098			
	Error Status				OK	OK	OK	OK.	OK	CK	CK			